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First Semester B.E. Degree Examination, Dec.2013/Jan.2014
Engineering Mathematics – I

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Answer all objective type questions only in OMR sheet page 5 of the answer booklet.*
3. *Answer to objective type questions on sheets other than OMR will not be valued.*

PART – A

1 a. Choose the correct answers for the following :   (04 Marks)

i) $D^n\left(\dfrac{1}{ax+b}\right) =$

A) $\dfrac{(n!)a^n}{(ax+b)^{n+1}}$ B) $\dfrac{(-1)^n(n!)a^n}{(ax+b)^{n+1}}$ C) $\dfrac{(-1)^n(n!)a^{n+1}}{(ax+b)^n}$ D) $\dfrac{(-1)^n(n!)a^{n+1}}{(ax+b)^n}$

ii) The angle between radius vector and tangent is

A) $\tan\phi = r\dfrac{dr}{d\theta}$ B) $\tan\phi = \dfrac{1}{r}\dfrac{dr}{d\theta}$ C) $\tan\phi = r\dfrac{d\theta}{dr}$ D) $\tan\phi = \dfrac{dr}{d\theta}$

iii) The nth derivative of $\sin(ax+b)$ is

A) $\sin\left(ax+b+\dfrac{n\pi}{2}\right)$ B) $a^n\cos\left(ax+b+\dfrac{n\pi}{2}\right)$

C) $a^n\sin\left(ax+b-\dfrac{n\pi}{2}\right)$ D) $a^n\sin\left(ax+b+\dfrac{n\pi}{2}\right)$

iv) Find ϕ, for the curve $r^2 = a^2\sin 2\theta$
A) $\phi = 2\theta$ B) $\phi = -2\theta$ C) $\phi = 4\theta$ D) $\phi = -4\theta$

b. Find the nth derivative of $\cos x\cos 2x\cos 3x$.   (04 Marks)
c. If $y = (\sin^{-1}x)^2$, show that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - n^2y_n = 0$.   (06 Marks)
d. Find the pedal equation of the parabola, $\dfrac{2a}{r} = 1-\cos\theta$.   (06 Marks)

2 a. Choose the correct answers for the following :   (04 Marks)

i) If $z = x^3 + y^3 - 3axy$, then $\dfrac{\partial z}{\partial x}$ is equal to

A) $+3x^2 - 3ay$ B) $-3x^2 - 3ay$ C) $3y^2 - 3ax$ D) $-3y^2 - 3ax$

ii) If $z = f(x+ct) + \phi(x-ct)$, then the value of $\dfrac{\partial^2 z}{\partial x^2}$ is

A) $f'(x+ct) + \phi'(x-ct)$ B) $f''(x+ct) + \phi''(x-ct)$
B) $f''(x+ct).c + \phi''(x-ct)c$ D) $f''(x+t) + \phi''(x-t)$

iii) If $f(x,y) = x^3 + y^3 + 3axy - 1$ then dy/dx is equal to

A) $\dfrac{x^2+y}{y^2+x}$ B) $-\dfrac{x^2+y}{y^2+x}$ C) $\dfrac{x^2-y}{y^2-x}$ D) $\dfrac{x^2-y}{y^2+x}$

iv) In polar co-ordinates, $x = r\cos\theta$, $y = r\sin\theta$ then $\dfrac{\partial(x,y)}{\partial(r,\theta)}$ is equal to

A) r^3 B) r^2 C) r D) $-r$

b. Show that $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}=2u\log u$ where $\log u=\dfrac{(x^3+y^3)}{(3x+4y)}$. **(04 Marks)**

c. If $u-F(x-y,\ y-z,\ z-x)$, prove that $\dfrac{\partial u}{\partial x}+\dfrac{\partial u}{\partial y}+\dfrac{\partial u}{\partial z}=0$. **(06 Marks)**

d. If $x=e^{V}\sec(u),\ y=e^{V}.\tan(u)$, prove that $J\times J'=1$. **(06 Marks)**

3 a. Choose the correct answers for the following : **(04 Marks)**

   i) The value of $\displaystyle\int_0^{\pi/2}\cos^6 x\,dx$ is

   A) $\dfrac{\pi}{32}$ B) $\dfrac{5\pi}{13}$ C) $\dfrac{5\pi}{32}$ D) $\dfrac{5\pi}{130}$

   ii) The equation of the asymptote of $y^2(a-x)=x^2(a+x)$ is
   A) $y=a$ B) $y=-a$ C) $x=-a$ D) $x=a$

   iii) The curve $x=a(\theta+\sin\theta),\ y=a(1+\cos\theta)$ is symmetrical about the
   A) x - axis   B) y - axis   C) xy - axis   D) None

   iv) The value of $\int\tan^n x\,dx$ is

   A) $\dfrac{\tan^{n-1}x}{n-1}-I_{n-2}$ B) $\dfrac{\tan^{n-1}x}{n-1}-I_{n-1}$ C) $\dfrac{\tan^{n-1}x}{n-1}+I_{n-2}$ D) $\dfrac{\tan^{n-1}x}{n-2}+I_{n-2}$

b. Obtain the reduction formula for $\int\sin^n x\,dx$. **(04 Marks)**

c. Evaluate $\displaystyle\int_0^{\pi}\theta\sin^6\theta\cos^4\theta\,d\theta$. **(06 Marks)**

d. Trace the curve $r^2=a^2\cos 2\theta$. **(06 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**

   i) The complete area of the ellipse, $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}=1$

   A) πab^2 sq.Units   B) $\pi a^2 b$ sq.Units   C) πab sq.Units   D) None of these

   ii) Length of the polar curve $r=f(\theta)$ is

   A) Length $=\displaystyle\int_{\theta=\alpha}^{\beta}\sqrt{\left(r^2+\left(\dfrac{dr}{d\theta}\right)^2\right)}\,d\theta$ B) Length $=\displaystyle\int_{\theta=\alpha}^{\beta}\left(r^2+\left(\dfrac{dr}{d\theta}\right)^2\right)d\theta$

   C) Length $=\displaystyle\int_{\theta=\alpha}^{\beta}\sqrt{\left(r^2-\left(\dfrac{dr}{d\theta}\right)^2\right)}\,d\theta$ D) Length $=\displaystyle\int_{\theta=\alpha}^{\beta}\sqrt{\left(r+\dfrac{dr}{d\theta}\right)}\,d\theta$

   iii) The volume of the solid generated by the revolution of the cardioid $r=a(1+\cos\theta)$ about the initial line is

   A) $\dfrac{4\pi a^3}{3}$ B) $\dfrac{6\pi a^3}{3}$ C) $\dfrac{8\pi a^3}{3}$ D) $\dfrac{10\pi a^3}{3}$

   iv) The surface area of the sphere of radius 'a' is
   A) $4\pi a^2$ sq.Units   B) $4\pi r$ sq.Units   C) $4\pi a$ sq.Units   D) $4\pi^2 a^2$ sq.Units

b. Find the entire length of the astroid, $x^{2/3}+y^{2/3}=a^{2/3}$ **(04Marks)**

c. Find the volume generated by an arc of the parabola $y^2=4ax$, from the vertex to the latus rectum about x-axis. **(06 Marks)**

d. Evaluate $\displaystyle\int_0^1\dfrac{x^{\alpha}-1}{\log x}\,dx,\ \alpha\geq 0$, using differentiation under integral sign. **(06 Marks)**

PART – B

5 a. Choose the correct answers for the following : (04 Marks)

i) The order of the differential equation, $\left[1+\left(\dfrac{dy}{dx}\right)^2\right]^3 = C^2\left(\dfrac{d^2y}{dx^2}\right)^2$ is

    A) 1   B) 2   C) 3   D) 4

ii) The degree of the differential equation , $y\dfrac{dy}{dx} = x\left(\dfrac{dy}{dx}\right)^2$ is

    A) 1   B) 2   C) – 2   D) – 1

iii) The differential equation of simple harmonic motion, $\dfrac{d^2x}{dt^2} + n^2 x = 0$ is formed from

    A) x = A cos(nt + α)   B) x = A sin(nt + α)

    C) x = A sin(nt – α)   D) x = A cos(nt – α)

iv) The orthogonal trajectory of the cardioids r = a(1 – cos θ) is

    A) r = a(1 – cosθ)   B) r = a(1 – sinθ)   C) r = a(1 + sinθ)   D) r = a′(1 + cosθ)

b. Solve : $\dfrac{dy}{dx} = (4x + y + 1)^2$ (04 Marks)

c. Solve : $(1+e^{x/y})dx + e^{x/y}\left(1-\dfrac{x}{y}\right)dy = 0$ (06 Marks)

d. Find the orthogonal trajectories of the family of confocal conics $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2+\lambda} = 1$, where λ is the parameter. (06 Marks)

6 a. Choose the correct answers for the following : (04 Marks)

i) If r = 1, then the series $1 + r + r^2 + r^3 + \ldots\ldots\infty$ is

    A) oscillates   B) converges   C) diverges   D) None of these

ii) The nth term of the series $\dfrac{1}{1.2.3} + \dfrac{3}{2.3.4} + \dfrac{5}{3.4.5} + \ldots\ldots\infty$ is

    A) $\dfrac{n}{n(n+1)(n+2)}$ B) $\dfrac{n+2}{n(n+1)(n+2)}$ C) $\dfrac{2n-1}{n(n+1)(n+2)}$ D) $\dfrac{2n+1}{n(n+1)(n+2)}$

iii) An alternating series $u_1 - u_2 + u_3 - u_4 + \cdots\cdots$ converges if

    A) $u_n > u_{n+1}$ and $\lim\limits_{n\to\infty} u_n = 0$ B) $u_n > u_{n-1}$ and $\lim\limits_{n\to\infty} u_n \neq 0$

    C) $u_n < u_{n+1}$ and $\lim\limits_{n\to\infty} u_n = 0$ D) $u_n > u_{n+1}$ and $\lim\limits_{n\to\infty} u_n \neq 0$

iv) The series $1 - \dfrac{1}{2^2} + \dfrac{1}{3^2} - \dfrac{1}{4^2} + \dfrac{1}{5^2} - \ldots\ldots$ is

    A) oscillatory   B) absolutely convergent

    C) divergent   D) conditionally convergent

b. Discuss the nature of the series;

$$\dfrac{x}{1} + \dfrac{1}{2}\cdot\dfrac{x^3}{3} + \dfrac{1.3}{2.4}\cdot\dfrac{x^5}{5} + \dfrac{1.3.5}{2.4.6}\cdot\dfrac{x^7}{7} + \ldots\ldots\infty, \; x > 0$$ (04 Marks)

c. Show that the series $\sum \dfrac{1}{n^P}$, converges if P > 1 and diverges if P ≤ 1. (06 Marks)

d. Examine the character of the series, $\displaystyle\sum_{n=1}^{\infty} \dfrac{(-1)^{n-1}n}{2n-1}$ (06 Marks)

7 a. Choose the correct answers for the following : **(04 Marks)**

   i) The projection of the join of two points $A(x_1, y_1, z_1)$ and $B(x_2, y_2, z_2)$ on the line PQ whose direction cosines are l, m, n is

   A) $(x_2 - x_1)(y_2 - y_1)(z_2 - z_1)$ B) $(x_2 - x_1)+(y_2 - y_1)+(z_2 - z_1)$
   C) $l(x_2 - x_1)+ m(y_2 - y_1)+ n(z_2 - z_1)$ D) $l(x_2 + x_1)+ m(y_2 + y_1)+ n(z_2 + z_1)$

   ii) The angle between two diagonals of a cube is

   A) $\theta = \cos^{-1}\left(\dfrac{1}{\sqrt{3}}\right)$ B) $\theta = \cos^{-1}\left(\dfrac{2}{\sqrt{3}}\right)$ C) $\theta = \cos^{-1}\left(\dfrac{1}{3}\right)$ D) $\theta = \cos^{-1}(3)$

   iii) The angle between the planes $2x - 3y + z + 5 = 0$ and $x + 2y + 7z - 3 = 0$ is

   A) $\theta = \cos^{-1}\left(\dfrac{1}{2\sqrt{21}}\right)$ B) $\theta = \cos^{-1}\left(\dfrac{1}{\sqrt{21}}\right)$ C) $\theta = \cos^{-1}\left(\dfrac{2}{\sqrt{21}}\right)$ D) $\theta = \cos^{-1}\left(\dfrac{1}{\sqrt{54}}\right)$

   iv) Two points form of equation of line is

   A) $\dfrac{x + x_1}{x_2 - x_1} = \dfrac{y + y_1}{y_2 - y_1} = \dfrac{z + z_1}{z_2 - z_1}$ B) $\dfrac{x - x_1}{x_2 + x_1} = \dfrac{y - y_1}{y_2 + y_1} = \dfrac{z - z_1}{z_2 + z_1}$

   C) $\dfrac{x - x_1}{x_2 - x_1} = \dfrac{y - y_1}{y_2 - y_1} = \dfrac{z - z_1}{z_2 - z_1}$ D) None of these.

   b. Find the direction cosines of the line which is perpendicular to the lines with direction cosines proportional to $6, 4, -4$ and $-6, 2, 1$. **(04 Marks)**

   c. Find the equation of the plane through $(2, -1, 6)$ $(1, -2, 4)$ and perpendicular to the plane $x - 2y - 2z + 9 = 0$. **(06 Marks)**

   d. Find the equation of a straight line perpendicular to both the lines $\dfrac{x-1}{1} = \dfrac{y-1}{2} = \dfrac{z+2}{3}$ and

   $\dfrac{x+2}{2} = \dfrac{y-5}{-1} = \dfrac{z+3}{2}$ and passing through the point of intersection. **(06 Marks)**

8 a. Choose the correct answers for the following : **(04 Marks)**

   i) Find $\dfrac{d\vec{r}}{dt}$, for $\vec{r} = a(\cos t \,\vec{i} + \sin t \,\vec{j}) + ct\,\vec{k}$, where a and c are scalar constant.

   A) $-a\cos t \,\vec{i} + \sin t \,\vec{j} + ct\,\vec{k}$ B) $-a\sin t \,\vec{i} + a\cos t j + c\,\vec{k}$
   C) $-a\sin t \,\vec{i} + a\cos t j - c\,\vec{k}$ D) $-a\sin t \,\vec{i} + a\sin t \,\vec{j} + ct\,\vec{k}$

   ii) If $\phi = x^3 y^3 z^3$, then $\nabla\phi$ at $(1, 2, 1)$ is

   A) $24\vec{i} - 12\vec{j} + 24\vec{k}$ B) $24\vec{i} + 24\vec{j} + 24\vec{k}$
   C) $24\vec{i} - 2\vec{j} + 24\vec{k}$ D) $24\vec{i} + 12\vec{j} + 24\vec{k}$

   iii) If $\vec{F} = \text{grad}(x^3 y + y^3 z + z^3 x - x^2 y^2 z^2)$ then the value of div $\vec{F}$ at $(1, 2, 3)$ is

   A) 16   B) -16 C) 32   D) -32

   iv) The value of $\nabla^2(r^n)$ is

   A) $n(n-1)r$ B) $n(n+1)r^2$ C) $n(n+1)r^n$ D) $n(n+1)r^{n-2}$

   b. Find the unit tangent vector to the curve $\vec{r} = \cos t \,\vec{i} + \sin t \,\vec{j} + t\,\vec{k}$. **(04 Marks)**

   c. Find the directional derivative of $\phi = x^2 yz + 4xz^2$ at the point $(1, -2, -1)$ in the direction of the vector $2i - j - 2k$. **(06 Marks)**

   d. If $\vec{F} = (ax + 3y + 4z)\,\vec{i} + (x - 2y + 3z)\,\vec{j} + (3x + 2y - z)\,\vec{k}$ is solenoidal, find 'a'. **(06 Marks)**

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First/Second Semester B.E. Degree Examination, Dec.2013/Jan.2014
Engineering Chemistry

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Answer all objective type questions only on OMR sheet page 5 of the answer booklet.*
3. *Answer to objective type questions on sheets other than OMR will not be valued.*

PART – A

1 a. Choose the correct answers for the following :   **(04 Marks)**
   i) A metal rod is dipped in a solution of its ions. Its electrode potential is independent of:
      A) temperature of solution   B) concentration of solution
      C) area of the metal exposed   D) nature of metal.
   ii) The emf of a cell consisting of a SHE and a metal is found to be 0.74V. The SHE is
       the positive electrode in the combination. Then the potential of the metal electrode is:
       A) +0.74V   B) +1.74V   C) +0.37V   D) -0.74V
   iii) Electrode potential of a metal in a dilute solution is:
       A) same as that in a concentrated solution
       B) lower than that in concentrated solution
       C) higher than that in a concentrated solution
       D) none of these.
   iv) The potential of the two metal electrodes used in a cell are 0.35V and 0.85V. The emf
       of the cell formed by combining them is:
       A) 1.20V   B) 0.5V   C) -0.50V   D) -1.20V.

   b. What are concentration cell? Explain the working of a concentration cell by taking suitable
      example.   **(05 Marks)**
   c. Explain a method for the determination of single electrode potential.   **(05 Marks)**
   d. An electrochemical cell consists of magnesium electrode in 0.042m mg$(NO_3)_2$ solution and
      silver electrode in 0.35m $AgNO_3$ solution. The SEP of Mg and Ag are -2.363V and +0.80V
      respectively. Represent the cell, write the cell reaction and calculate the emf of the cell.
                                                                              (06 Marks)

2 a. Choose the correct answers for the following :   **(04 Marks)**
   i) In lead acid battery the product formed on both anode and cathode is:
      A) PbO_2 B) PbO   C) $PbSO_4$ D) Pb.
   ii) A battery in which a key component is separated from the battery prior to its activation
       is called:
       A) Primary battery   B) Secondary battery   C) Tertiary battery   D) Reserve battery
   iii) In which of these batteries aqueous KOH is used as an electrolyte?
       A) Ni-cd   B) Ni-MH   C) Zn-air   D) All of these
   iv) In which of the following battery the cell reaction is not reversible?
       A) Pb-PbO_2 B) Li-MnO_2 C) Ni-MH   D) Ni-Cd

   b. Explain the construction and working of Zn-MnO_2 battery.   **(05 Marks)**
   c. What are fuel cells? How it differ from battery? Explain the construction and working of
      CH_3OH-O_2 fuel cell.   **(07 Marks)**
   d. Write the discharging and charging reactions in the following batteries:
      i) Ni-Cd battery;   ii) Ni-MH battery.   **(04 Marks)**

3 a. Choose the correct answers for the following : (04 Marks)

   i) When a buried pipeline is protected from corrosion by connecting to magnesium block it is called:

     A) Impressed voltage protection   B) Sacrificial cathodic protection

     C) Sacrificial anodic protection   D) None of these.

   ii) During galvanic corrosion the move noble metal act as:

     A) anode   B) cathode

     C) anode as well as cathode   D) None of these

   iii) In water line corrosion, the maximum amount of corrosion take place:

     A) along a line just above the level of water meniscus

     B) along a line at the level of water meniscus

     C) along a line just below the level of water meniscus

     D) at the bottom of the vessel.

   iv) During differential aeration type corrosion, the corrosion:

     A) occurs at more oxygenated part   B) occurs at less oxygenated part

     C) occurs uniform throughout   D) none of these.

b. What is metallic corrosion? Explain electrochemical theory of corrosion by taking iron as example. (06 Marks)

c. Explain the corrosion control technique by cathodic protection. (06 Marks)

d. Explain galvanization process. (04 Marks)

4 a. Choose the correct answers for the following : (04 Marks)

   i) In chromium plating electrolyte used in the bath solution:

     A) $H_2CrO_4 + H_2SO_4$ B) $K_2CrO_4 + H_2SO_4$

     C) $HClO_4 + H_2CrO_4$ D) None of these

   ii) Printed circuit boards are prepared by the process of:

     A) Electroplating   B) Electro polishing

     C) Electroless plating   D) Electroforming

   iii) The ability of the plating bath to develop uniform coating on the entire surface of the object is measured by its:

     A) Current density   B) Decomposition potential

     C) Plating power   D) Throwing power

   iv) Polarization effect can be minimized by using:

     A) Large electrode surface   B) Highly conducting solution

     C) Low electrolyte concentration   D) All of these

b. Explain the following terms:

   i) Polarization

   ii) Decomposition potential. (06 Marks)

c. Explain how the following plating variables affect the nature of electro deposit:

   i) Current density

   ii) pH

   iii) Complexing agent. (06 Marks)

d. What is electroless plating? Explain electroless plating of copper. (04 Marks)

PART – B

5 a. Choose the correct answers for the following : (04 Marks)
  i) A knocking sound is produced in the internal combustion engine when the fuel:
    A) burns slowly
    B) burns fact
    C) contains rain water
    D) None of these
  ii) For good performance, the hydrocarbon molecules in a diesel fuel should be:
    A) Straight chained
    B) Branched chain
    C) Side chained
    D) Aromatic
  iii) Catalytic cracking of heavy oil is carried out to get better quality:
    A) Kerosene
    B) Diesel
    C) Gasoline
    D) Lubricating oil
  iv) Suitability of diesel fuel is determined by:
    A) octane number
    B) propane number
    C) cetane number
    D) butane number.

  b. Define calorific value. Explain how calorific value of solid fuel is determined by bomb calorimeter. (07 Marks)
  c. 0.78g of coal containing 1.9% hydrogen, when burnt in a bomb calorimeter, increased the temperature of 2.7kg water from $27.2°C$ to $29.7°C$. If the water equivalent of calorimeter is 1.2kg. Calculate gross and net calorific value (specific neat of water 4.187 kJ/kg/°C, latent heat of steam 2457 kJ/kg. (05 Marks)
  d. Explain the purification of silicon by zone refining process. (04 Marks)

6 a. Choose the correct answers for the following : (04 Marks)
  i) For water system the maximum number of degrees of freedom:
    A) 0
    B) 3
    C) 2
    D) 4
  ii) When lead is progressively added to molten silver, the melting point of the resultant alloy is:
    A) raised
    B) lowered
    C) unaltered
    D) unpredictable
  iii) The colorimetric analysis is based on:
    A) Faraday's law
    B) Beer-Lambert's law
    C) Ohm's law
    D) Kohlrauen's law
  iv) In potentiometric titration platinum electrode act as:
    A) reference electrode
    B) standard electrode
    C) reduction electrode
    D) indicator electrode.

  b. Draw phase diagram of Fe-C system. Explain eutectic and eutectoid point. (06 Marks)
  c. Explain Pattinson's process of desilverization of read. (04 Marks)
  d. Discuss the theory and instrumentation of potentiometric titration. (06 Marks)

7   a.   Choose correct answers for the following :   (04 Marks)
    i)   A plastic which can be softened in heating and hardened on cooling is called:
         A) thermoplastic   B) thermosetting
         C) thermoelastic   D) thermite
    ii) Which of the following is an elastomer:
         A) PVC   B) Bakelite
         C) Nylon   D) Neoprene
    iii) Chloroprene is the repeating unit in:
         A) Polystyrene   B) Neoprene
         C) PVC   D) Polythene
    iv) The process of vulcanization makes rubber:
         A) Soluble in water   B) Soft
         C) Hard   D) More elastic.

    b.   What is glass transition temperature? Explain any three factors that influence the glass transition temperature.   (04 Marks)
    c.   Explain the manufacture of plastic by compression moulding and injection moulding technique.   (06 Marks)
    d.   Give the synthesis of i) Teflon; ii) Neoprene; iii) Polyurethane.   (06 Marks)

8   a.   Choose the correct answers for the following :   (04 Marks)
    i)   Total alkalinity in water is the sum of:
         A) OH^- and CO_3^{2-} ions   B) OH^- ions only
         C) CO_3^{2-} ions only   D) OH^-, HCO_3^{2-} and CO_3^{2-} ions.
    ii) The indicator used in the determination of chloride context in water sample by argentometric method is:
         A) $K_3[Fe(CN)_6]$ B) K_2CrO_4
         C) $K_2[Fe(CN)_6]$ D) $K_2CN_2O_7$
    iii) Primary treatment of sewage is used to remove:
         A) Suspended and floating solids   B) Soluble inorganic solids
         C) Pathogenic bacteria   D) All of these
    iv) The reagent used in the estimation of sulphate by gravimetric method is:
         A) Phenol-di-sulphonic acid   B) Barium chloride
         C) 2-SPADANS   D) Barium sulphate.

    b.   Discuss the determination of chloride in water by argentometric method.   (06 Marks)
    c.   How is alkalinity of water caused? Explain the determination of alkalinity by phenolphthalein indicator.   (06 Marks)
    d.   Define COD. Explain the sewage treatment of activated sludge process.   (04 Marks)

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First/Second Semester B.E. Degree Examination, Dec.2013/Jan.2014
Engineering Physics

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Answer all objective type questions only on OMR sheet page 5 of the answer booklet.*
3. *Answer to objective type questions on sheets other than OMR will not be valued.*
4. *Physical constants :* $h = 6.625 \times 10^{-34}$ *J-S,* $C = 3 \times 10^8\,mS^{-1}$, $m_e = 9.1 \times 10^{-31}\,kg$,
$K = 1.38 \times 10^{-23}\,Fm^{-1}$, $\epsilon_0 = 8.854 \times 10^{-12}\,Fm^{-1}$.

PART – A

1 a. Choose the correct answers for the following :   **(04 Marks)**
   i) De Broglie wavelength of an electron accelerated through a potential of 60 V is,
      A) 1.850 A°   B) 1.584 A°   C) 1.589 A°   D) 1.570 A°
   ii) The wavelength of maximum intensity is inversely proportional to the absolute temperature of the body emitting radiation. This is called,
      A) Stefan's law   B) Wein's displacement law
      C) Rayleigh-Jean's law   D) Plank's law
   iii) Einstein's photoelectric equation is given by,
      A) $E = \phi + (KE)_{max}$ B) $E = \phi - (KE)_{max}$ C) $\phi = E + (KE)_{max}$ D) $(KE)_{max} = E + \phi$
   iv) Which of the following relations can be used to determine de Broglie wavelength associated with a particle?
      A) $\dfrac{h}{\sqrt{2mE}}$ B) $\dfrac{h}{mV}$ C) $\dfrac{h}{\sqrt{2meV}}$ D) all of these

   b. Explain Wein's law ad Rayleigh-Jean's law. Mention their drawbacks.   **(06 Marks)**
   c. Define phase velocity and group velocity. Derive a relation between the two.   **(06 Marks)**
   d. Calculate the wavelength associated with electrons whose sped is 0.01 part of the speed of light.   **(04 Marks)**

2 a. Choose the correct answers for the following :   **(04 Marks)**
   i) For a particle in an infinite potential well in its 1st excited state, the probability of finding the particle at the center of box is,
      A) 0   B) 0.25   C) 0.5   D) 0.1
   ii) The Heisenberg's Uncertainty relation for position of a particle is given by,
      A) $\Delta P_x \Delta x \geq \dfrac{h}{2}$ B) $\Delta P_x \Delta x \leq \dfrac{h}{4\pi}$ C) $\Delta P_x \Delta x \geq \dfrac{h}{4\pi}$ D) $\Delta P_x \Delta x \geq \dfrac{h}{\pi}$
   iii) According to Max Born approximation $|\psi|^2$ represents,
      A) Particle density   B) Charge density   C) Energy density   D) Probability density
   iv) Schrodinger's time independent wave equation is applicable for the particle with,
      A) Constant energy   B) Variable energy
      C) Only constant potential energy   D) All of these

   b. Set up time independent Schrodinger wave equation.   **(06 Marks)**
   c. Explain Heisenberg's Uncertainty principle. Give its physical significance.   **(06 Marks)**
   d. An electron is bound in one dimensional infinite well of width 0.12 nm. Find the energy value and de Broglie wavelength in the first excited state.   **(04 Marks)**

3 a. Choose the correct answers for the following : (04 Marks)

    i) The motor specific heat of a gas at constant volume is given by,

        A) $C_V = \dfrac{2R}{3}$ B) $C_V = \dfrac{3R}{2}$ C) $C_V = \dfrac{4R}{3}$ D) $C_V = \dfrac{3R}{4}$

    ii) If the Fermi energy of silver is 5.5 eV, the Fermi velocity of conduction electron is,

        A) 0.98×10^6 m/S   B) 1.39×10^6 m/S   C) 2.46×10^5 m/S   D) None of these

    iii) Matthiessen's rule is given by,

        A) $\rho = \rho_{ph} - \rho_i$ B) $\rho = \dfrac{\rho_{ph}}{\rho_i}$ C) $\rho = \rho_{ph} + \rho_i$ D) $\rho = \dfrac{\rho_i}{\rho_{ph}}$

    iv) The value of Fermi distribution function at T = 0 K is 1, under the condition,

        A) $E = E_f$ B) $E > E_f$ C) $E \gg E_f$ D) $E < E_f$

  b. Explain failure of classical free electron theory. (06 Marks)

  c. Explain the probability of occupation of various energy states by electron at T= 0 K and T > 0 K on the basis of Fermi factor. (06 Marks)

  d. Find the temperature at which there is 1.0 % probability that a state with an energy 0.5 eV above Fermi energy will be occupied. (04 Marks)

4 a. Choose the correct answers for the following : (04 Marks)

    i) Choose the correct relation,

        A) $E = \epsilon_0 (\epsilon_r - 1)P$ B) $P = \epsilon_0 (\epsilon_r - 1)E$ C) $\epsilon_r = K - 1$ D) $D = \epsilon_0 (\epsilon_r - 1)E$

    ii) For ferromagnetic substance, the Curie-Weiss law is given by,

        A) $\chi = \dfrac{C}{T}$ B) $\chi = \dfrac{C}{(T - \theta)}$ C) $\chi = \dfrac{(T - \theta)}{C}$ D) $\chi = \dfrac{C}{(T + \theta)}$

    iii) The only polarization mechanism at frequencies exceeding 10^{13} Hz is,

        A) ionic   B) electronic   C) orientation   D) space charge

    iv) Sulphur is an elemental solid dielectric of atomic weight 32.07 and density 2.07×10^3 kgm^{-3}. The number of atoms per unit volume for Sulphur is,

        A) 3.89×10^{28} /m^3 B) 3.89×10^{25} /m^3 C) 9.3×10^{24} /m^3 D) None of these

  b. Derive an expression for internal field in case of one dimensional array of atoms in dielectric solid. (08 Marks)

  c. Describe ferroelectrics. (04 Marks)

  d. If a WaCl crystal is subjected to an electric field of 1000 V/m and the resulting polarization is 4.3×10^{-8} C/m^2, calculate the static dielectric constant of NaCl. (04 Marks)

PART – B

5 a. Choose the correct answers for the following : (04 Marks)

    i) If n_1 is the number density of lower energy E_1 and n_2 is the number density of higher energy E_2, then $n_2 > n_1$ is called,

        A) thick population   B) inverted population

        C) normal population   D) no population

    ii) The number of modes of standing waves in the resonant cavity of length 1 m, if He – We laser operating at wavelength of 6328 A° is,

        A) 3.16×10^6 B) 1.58×10^6 C) 3.16×10^8 D) None of these

    iii) Image is stored on a hologram in the form of,

        A) interference pattern   B) diffraction pattern

        C) photograph   D) none of these

    iv) The relation between Einstein's coefficients A & B is,

        A) $\dfrac{8\pi h \lambda^3}{C^3}$ B) $\dfrac{8\pi h^2 r^3}{C^3}$ C) $\dfrac{8\pi hr^3}{C^3}$ D) $\dfrac{8\pi hr^3}{C^2}$

5 b. Explain the process of spontaneous and stimulated emission. (06 Marks)

  c. Describe the construction and working of semiconductor laser. (06 Marks)

  d. A pulse laser has an average power output 1.5 mW per pulse and pulse duration is 20 ns. The number of photon emitted per pulse is estimated to be 1.047×10^8. Find the wavelength of the emitted laser. (04 Marks)

6 a. Choose the correct answers for the following : (04 Marks)

  i) The variation of critical field H_c with temperature T is given by,

  A) $H_C = H_O \left[1 - \left(\dfrac{T}{T_C} \right)^2 \right]$

  B) $H_C = H_O \left[1 + \left(\dfrac{T}{T_C} \right)^2 \right]$

  C) $H_C = H_O \left[1 - \dfrac{T}{T_C} \right]$

  D) $H_C = H_O \left[1 + \dfrac{T}{T_C} \right]$

  ii) The quantum of magnetic flux is given by,

  A) $\dfrac{2h}{e}$

  B) $\dfrac{h}{2e}$

  C) $\dfrac{he}{2}$

  D) $\dfrac{2\pi h}{e}$

  iii) Fractional index change of optical fiber and refractive index of core are 0.00515 and 1.533 respectively. The cladding refractive index is,
  A) 1.492   B) 1.525   C) 1.499   D) 1.511

  iv) The attenuation of a fiber – optical cable is expressed in,
  A) ohm / km   B) watt / km   C) decibel / km   D) joule / km

  b. Describe type – I and type – II superconductors. (06 Marks)

  c. What is attenuation? Explain any two factors contributing to the fibre loss. (06 Marks)

  d. The angle of acceptance of an optical fibre is 30° when kept in air. Find the angle of acceptance when it is in a medium of refractive index 1.33. (04 Marks)

7 a. Choose the correct answers for the following : (04 Marks)

  i) The relation between atomic radius and lattice constant in FCC structure is,

  A) $a = 2r$

  B) $a = 2\sqrt{2}r$

  C) $a = \dfrac{\sqrt{3}}{4}r$

  D) $a = \dfrac{4r}{\sqrt{3}}$

  ii) The crystal with lattices $a = b \neq c$ and angles $\alpha = \beta = \gamma = 90°$ represents,
  A) cubic   B) hexagonal   C) orthorhombic   D) tetragonal

  iii) The number of atoms present in the unit cell of diamond cubic crystal structure is,
  A) 2   B) 4   C) 8   D) 16

  iv) Bragg's law is given by,

  A) $2\sin\theta = n\lambda$

  B) $2d\sin\theta = n\lambda$

  C) $\dfrac{2dn}{\sin\theta} = \lambda$

  D) $2n\lambda = \sin\theta$

  b. Define (i) Coordination number (ii) Packing factor. Calculate the atomic packing factor for BCC structure. (06 Marks)

  c. Sketch the $(1\ \bar{1}\ 2)$, $(1\ 1\ 0)$ and $(1\ 0\ 0)$ planes in a simple cubic unit cell. Explain the procedure for obtaining miller indices. (06 Marks)

  d. The minimum order of Bragg's reflection occurs at an angle of 20° in the plane (2 1 2). Find the wavelength of X-rays if lattice constant is 3.615 A°. (04 Marks)

8 a. Choose the correct answers for the following : **(04 Marks)**
   i) In a carbon nanotube the bond between the carbon atom is,
      A) metalic   B) ionic   C) hydrogen   D) covalent
   ii) A constant testing of product without causing any damage is called,
      A) minute testing   B) destructive testing
      C) non-destructive testing   D) random testing
   iii) Ultrasonic waves are sound waves having,
      A) Velocity greater than 330 mS^{-1} B) Velocity less than 330 mS^{-1}
      C) Frequency greater than 20 kHz   D) Frequency less than 20 kHz
   iv) Which of the procedure is not employed to detect the internal flows by a material,
      A) Ultrasonic method   B) Magnetic method
      C) Alpha ray method   D) Dynamic testing

   b. Explain carbon nanotubes and its application by giving physical properties. **(08 Marks)**
   c. What are ultrasonics? Explain with a diagram a method for measurement of velocity of ultrasonic waves in liquids. **(08 Marks)**

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USN ☐☐☐☐☐☐☐☐☐☐ 10CIV13/23

First/Second Semester B.E. Degree Examination, Dec.2013/Jan.2014
Elements of Civil Engineering and Engineering Mechanics

Time: 3 hrs. Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
  2. *Answer all objective type questions only in OMR sheet page 5 of the answer booklet.*
  3. *Answer to objective type questions on sheets other than OMR will not be valued.*

PART – A

1 a. Choose the correct answers for the following : **(04 Marks)**
   i) A bridge constructed at some angle to river flow is
       A) skew bridge   B) square bridge   C) steel bridge   D) lift bridge
   ii) The structure that separates roads into separate lanes is called
       A) Kerb   B) median   C) road margin   D) camber
   iii) The upstream side of a dam
       A) arch dams   B) gravity dam   C) earth dam   D) reservoir
   iv) Geotechnical engineering involves the study of
       A) water   B) soil   C) air   D) none of these

   b. With the help of neat sketches, briefly explain the cross-section of road and gravity dam.
      (10 Marks)

   c. What are infrastructure related projects? **(06 Marks)**

2 a. Choose the correct answers for the following : **(04 Marks)**
   i) The component of a force perpendicular to its line of action is
       A) maximum   B) minimum   C) zero   D) none of these
   ii) The moment of a force about a moment centre lying on its line of action is
       A) maximum   B) minimum   C) zero   D) none of these
   iii) Two equal and opposite forces separated by a distance will produce
       A) translation   B) rotation
       C) both translation and rotation   D) none of these
   iv) Moment of a force will produce
       A) translation   B) rotation
       C) both translation and rotation   D) none of these

   b. A block weighing w = 10 kN is resting on an inclined plane as shown in Fig.Q2(b).
      Determine its components normal to and parallel to the inclined plane. The plane makes an
      angle of 20° with the horizontal. **(04 Marks)**

   c. A body is subjected to the three forces as shown in Fig.Q2(c). If possible determine the
      direction of the force "F" so that the resultant is in 'x' direction, when (i) F = 5000 N,
      (ii) F = 3000 N. **(12 Marks)**

3 a. Choose the correct answers for the following : **(04 Marks)**
   i) In case of coplanar concurrent force the resultant force passes through
       A) point of concurrence   B) away from point of concurrence
       C) different plane   D) none of these
   ii) If two concurrent forces each of 'P' act at right angles to each other, their resultant is
       A) 2P   B) P   C) $\sqrt{2}$ P   D) $2\sqrt{P}$
   iii) If $\sum V = 0$ and $\sum H = 0$ for a coplanar nonconcurrent force system, then it is in
       A) equilibrium   B) translation   C) rotation   D) none of these
   iv) Conditions of equilibrium for a coplanar concurrent force system is
       A) one   B) two   C) three   D) four

3 b. Two forces acting on a body are 500 N and 1000 N as shown in Fig.Q3(b). Determine the third force "F" such that the resultant of all the three forces is 1000 N directed at 45° to 'x' axis. **(06 Marks)**

c. Determine the resultant of the four forces acting on a body as shown in Fig.Q3(c) with respect to point "O". **(10 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**
  i) The centroid of a triangle of height 'h' is located at a _____ distance from its apex.
  A) h/2   B) 2h/3   C) h/3   D) h
  ii) Intersection of _____ number of symmetrical axes will give centroid of plane area.
  A) 3   B) 4   C) 2   D) none of these
  iii) Moment of an area about a reference axis passing through its centroid is
  A) maximum   B) minimum   C) zero   D) none of these
  iv) Centroid of a semicircle from an axis passing through the diameter is
  A) $\frac{4r}{3\pi}$ B) $\frac{3r}{4\pi}$ C) $\frac{3\pi}{4r}$ D) $\frac{4\pi}{3r}$

b. Determine the centroid of a semi-circular lamina of radius "r" by the method of integration. **(06 Marks)**

c. Determine the centroid of the shaded area shown in the Fig.Q4(c) with respect to OX and OY. **(10 Marks)**

PART – B

5 a. Choose the correct answers for the following : **(04 Marks)**
  i) If three forces are acting at a point and are in equilibrium, out of which two are acting in the same line, then the third force is
  A) maximum   B) minimum   C) zero   D) none of these
  ii) A rigid body is in equilibrium if the resultant force of concurrent force system is
  A) positive   B) negative   C) zero   D) none of these
  iii) Lami's theorem is valid for _____ number of concurrent forces in equilibrium.
  A) two   B) three   C) four   D) none of these
  iv) The force equal and opposite to resultant is called as
  A) equilibriant   B) similar force   C) opponent force   D) none of these

b. State and prove Lami's theorem. **(06 Marks)**

c. The frictionless pulley 'A' shown in Fig.Q5(c) is supplied by two bars AB and AC which are hinged at 'B' and 'C' to a vertical wall. The flexible cable DG hinged at 'D', goes over the pulley and supports a load of 20 kN at 'G'. The angles between the various members are shown in the figure. Determine the forces in the bars AB and AC. Neglect the size and weight of the pulley. **(10 Marks)**

6 a. Choose the correct answers for the following : **(04 Marks)**
  i) A hinged support can have _____ reactions.
  A) 2   B) 4   C) 1   D) none of these
  ii) A determinate beam can have _____ number of unknowns.
  A) 2   B) 3   C) 1   D) 4
  iii) A fixed support can have _____ reactions.
  A) 1   B) 2   C) 3   D) 4
  iv) udl stands for
  A) Uniformly distributed load   B) Uniform dead load
  C) Uniform door load   D) Uniform diameter load

b. The cantilever beam shown in Fig.Q6(b) is fixed at 'A' and is free at 'B'. Determine the reaction when it is loaded as shown. **(06 Marks)**

c. Find the forces in all the members of the truss loaded s shown in the Fig.6(c). Tabulate the results. **(10 Marks)**

7 a. Choose the correct answers for the following : **(04 Marks)**
   i) Compared to static friction, kinetic friction is
      A) greater   B) smaller   C) very large   D) zero
   ii) Friction force is _____ to the contact surface between bodies.
      A) parallel   B) perpendicular   C) tangential   D) none of these
   iii) Friction force is a _____ force.
      A) active   B) passive   C) normal   D) none of these
   iv) The tangent of the angle of friction is _____.
      A) angle of repose   B) coefficient of friction
      C) cone of friction   D) limiting friction

   b. Define: i) Angle of friction; ii) Coefficient of friction; iii) Cone of friction. **(06 Marks)**
   c. What is the value of 'P' in the system shown in Fig.Q7(c), to cause the motion to impend to the right? Assume the pulley is smooth and coefficient of friction between the other contact surfaces is 0.20. **(10 Marks)**

8 a. Choose the correct answers for the following : **(04 Marks)**
   i) Unit of second moment of area is
      A) m   B) m^2 C) m^4 D) m^5
   ii) Unit of radius of gyration is _____.
      A) m   B) m^2 C) m^3 D) m^4
   iii) Moment of inertia of a square of side 'b' about an axis through its centroid is
      A) $\dfrac{b^4}{12}$ B) $\dfrac{b^4}{8}$ C) $\dfrac{b^4}{36}$ D) $\dfrac{b^3}{12}$
   iv) P_{dar} moment of inertia is
      A) $I_{xx} + I_{yy}$ B) $I_{xx} + I_{zz}$ C) $I_{yy} + I_{zz}$ D) none of these

   b. Define: i) Moment of inertia; ii) Radius of gyration; iii) Polar moment of inertia. **(06 Marks)**
   c. Determine the moment of inertia of the symmetrical I-section shown in Fig.Q8(c) about its centroidal X-X and Y-Y axis. **(10 Marks)**
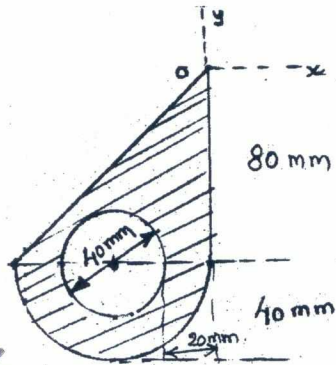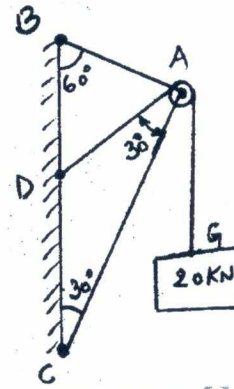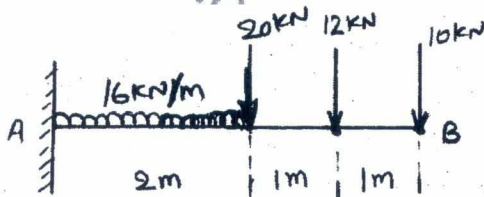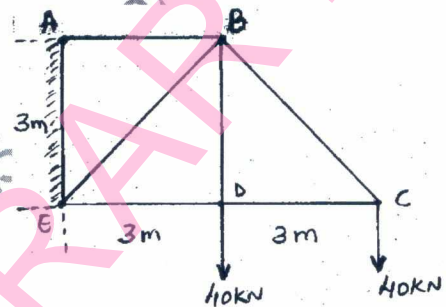

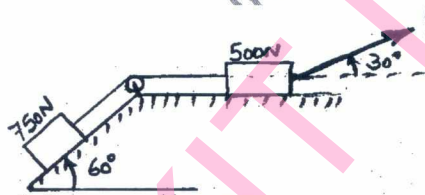Fig.Q2(b)

Fig.Q2(c)

Fig.Q3(b)

Fig.Q3(c)
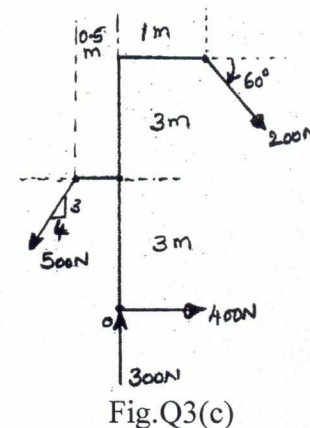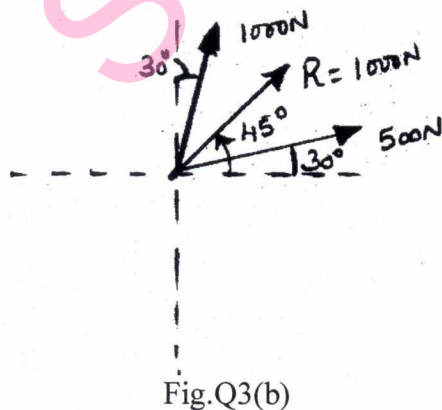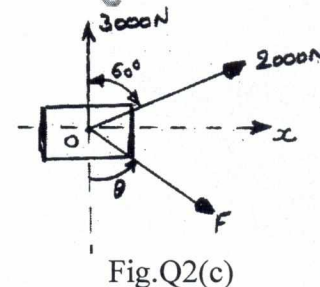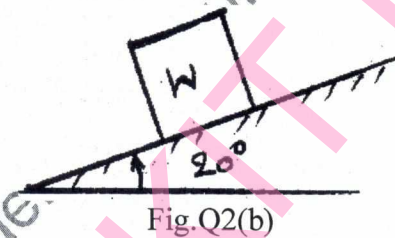
Fig.Q4(c)

Fig.Q5(c)

Fig.Q6(b)

Fig.Q6(c)

Fig.Q7(c)

Fig.Q8(c)

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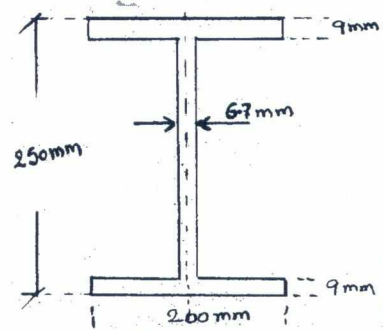
First/Second Semester B.E. Degree Examination, Dec.2013/Jan.2014

Computer Concepts and C Programming

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Answer all objective type questions only in OMR sheet page 5 of the answer booklet.*
3. *Answer to objective type questions on sheets other than OMR will not be valued.*

PART – A

1   a.   Choose the correct answers for the following :   (04 Marks)
     i)   Which of the following is not a type of keyboard connector?
          A) 5-pin connector   B) 6-pin connector
          C) 8-pin connector   D) USB-connector
     ii)   Which of the following is not an output device of a computer?
          A) printer   B) keyboard   C) VDU   D) CRT screen
     iii) Who is called the father of the computer?
          A) Balise Pascal   B) Charles Babbage
          C) Joseph Jacquard   D) Dr. Hewrman Hollerith
     iv)   Which generation of computers is covered by the period 1964-1971?
          A) First   B) Second   C) Third   D) Fourth
     b.   Briefly explain about the various generations of computers.   (06 Marks)
     c.   With a neat figure, explain how instructions are processed by the CPU.   (05 Marks)
     d.   Describe briefly about the various keys present on a standard keyboard.   (05 Marks)

2   a.   Choose the correct answers for the following :   (04 Marks)
     i)   Which is a secondary memory device?
          A) CPU   B) ALU   C) Floppy disk   D) Mouse
     ii)   If you want to execute more than one program at a time, the systems software that you
          must be capable of
          A) word processing   B) virtual memory   C) compiling   D) multitasking
     iii) A translator which reads an entire program written in a high level language and
          converts it into machine language code is
          A) assembler   B) translator   C) compiler   D) system software
     iv)   Which of the following is not an Application Software?
          A) Word processing   B) Spreadsheet
          C) UNIX   D) Desktop publishing
     b.   Explain in detail about the construction and operation of the hard disk drive.   (05 Marks)
     c.   Briefly write about various computer processing techniques to process data.   (07 Marks)
     d.   List the different network components with examples.   (04 Marks)

3   a.   Choose the correct answers for the following :   (04 Marks)
     i)   The flowcharting symbol Diamond Shaped Box indicates
          A) Start   B) Process step   C) Decision   D) End
     ii)   Which of the following is not a keyword in C?
          A) char   B) break   C) triangle   D) long
     iii) Which of the following is an input function?
          A) scanf   B) printf   C) puts( )   D) putchar( )
     iv)   Which of the following is a valid integer?
          A) –250   B) 4,442   C) –31.89   D) +3,728.2

3 b. What are the different built-in data types available with C? **(06 Marks)**

c. With an example, explain the structure of a typical C program. **(06 Marks)**

d. Briefly write what do you mean by the C tokens. **(04 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**

    i) Which of the following is not a relational operator in C language?

       A) <   B) > =   C) ! =   D) &

    ii) Which of the following is a special operator in C language?

       A) sizeof ( )   B) log (x)   C) exp (x)   D) sin (x)

    iii) The unary operator in C are used to act upon only _____ operand.

       A) one   B) two   C) three   D) four

    iv) If b = 10 and d = 3, what is the result for b%d operation?

       A) one   B) two   C) three   D) 3.33

b. Explain relational operators in C, with examples. **(06 Marks)**

c. With an example, explain the Unary operator in C language. **(04 Marks)**

d. Explain in detail about Bitwise operators in C language. **(06 Marks)**

PART – B

5 a. Choose the correct answers for the following : **(04 Marks)**

    i) The function that calls itself is called as _____.

       A) forwarding function   B) conditional function

       C) recursive function   D) backward function

    ii) The main( ) function work is defined in _____ library.

       A) stdio.h   B) conio.h   C) string.h   D) math.h

    iii) Parameters passed as arguments to the function call are called as _____.

       A) actual parameters   B) formal parameters

       C) no parameters   D) none of these

    iv) Which of the following return statements in a function has error?

       A) return   B) return(0)

       C) return(expression)   D) none of these

b. What is a function? Describe with declaration syntax. **(04 Marks)**

c. Describe the two ways of passing parameters to function with examples. **(08 Marks)**

d. Write a program to test whether or not a given integer number is prime with function.

                                                          (04 Marks)

6 a. Choose the correct answers for the following : **(04 Marks)**

    i) Which of the following looping construct is an entry controlled loop?

       A) while   B) do-while   C) for   D) none of these

    ii) Which of the following is a conditional statement that tests a value against different values?

       A) while   B) for   C) switch   D) if

    iii) Which of the following is not a jump statement?

       A) break   B) continue   C) go to   D) for

    iv) Which of the following is an exit controlled loop?

       A) if   B) do-while   C) while   D) if-else

b. Write and explain the declaration syntax for while and do…while loop. **(04 Marks)**

c. Write a program to compute the sum of N numbers using the for loop. **(06 Marks)**

d. Write a program to check whether the given alphabet is a vowel or not using switch statement. **(06 Marks)**

7   a.   Choose the correct answers for the following :   (04 Marks)
         i)   In an array a[5] = {10, 20, 30, 40, 50}; the element 40 is designated as
               A) a[0]   B) a[1]   C) a[3]   D) a[4]
         ii)   In an array int a[2][3] = {10, 20, 30, 40, 50, 60}; the a[0][1] element is
               A) 10   B) 40   C) 60   D) 20
         iii) Which of the following string handling function is used to add two strings?
               A) strcat( )   B) strncat( )   C) strcmp( )   D) strlwr( )
         iv)   Which of the following string handling function is used to compare two strings?
               A) strlen( )   B) strcmp( )   C) strcpy( )   D) strrev( )
    b.   Define an array. How are they declared in C language?   (04 Marks)
    c.   Write a program to read two matrices from keyboard and print the sum of two matrices.
                                                                                            (07 Marks)
    d.   Write a program to test whether the given string is a Palindrome or not.   (05 Marks)

8   a.   Choose the correct answers for the following :   (04 Marks)
         i)   Thread is defined as _____ stream of control flow in a program code.
               A) zero   B) single   C) control   D) none of these
         ii)   Open MP programming model offers parallel directives for
               A) Shared Memory Access   B) Zero Memory Access
               C) Multiple Memory Access   D) None of these
         iii) _____ execution of instructions in a computer system is referred to as parallel
               computing.
               A) Serial   B) Sequential   C) Accurate   D) Simultaneous
         iv)   Open MP stands for _____.
               A) Open Multi-Parallelism   B) Organized Multi-Programming
               C) Open Multi-Processing   D) Organized Multi-Parallelism
    b.   What are threads? Give the advantages and disadvantages of multiple threads.   (06 Marks)
    c.   Bring out the scope for Parallel computing.   (06 Marks)
    d.   Explain "Parallel computing" in detail.   (04 Marks)

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USN ☐☐☐☐☐☐☐☐☐☐ 10EME14/24

First/Second Semester B.E. Degree Examination, Dec.2013/Jan.2014

Elements of Mechanical Engineering

Time: 3 hrs. Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Answer all objective type questions only in OMR sheet page 5 of the answer booklet.*
3. *Answer to objective type questions on sheets other than OMR will not be valued.*
4. *Use of steam table is permitted.*

PART – A

1 a. Choose the correct answers for the following : **(04 Marks)**
    i) Coal is an example for _____ energy sources.
        A) renewable   B) non-renewable   C) celestial energy   D) bio-mass
    ii) Photosynthesis process is also known as
        A) Helio thermal process   B) Helio chemical process
        C) Helio electrical process   D) Pizeo electric process
    iii) Partially dry steam and partially wet particles in steam called as
        A) dry steam   B) super heated steam
        C) saturated water   D) wet steam
    iv) Babcock and Wilcox boiler is an example for _____.
        A) fire tube boiler   B) vertical boiler
        C) single tube boiler   D) externally fired boiler
   b. Name any four boiler mountings and state their functions. **(02 Marks)**
   c. With the help of neat sketch, explain the working of a Francis turbine. **(08 Marks)**
   d. Determine the total heat content per unit mass at the following state using the steam tables. Assume ambient pressure to be 100 kPa and C_P = 2.0934 kJ/kg.
    i) 10 bar absolute and 300°C
    ii) 100 kPa gauge and 100 kPa abs and 250°C
    iii) Dry steam at 100 kPa abs
    iv) Steam at 12 bar and 95% dry. **(06 Marks)**

2 a. Choose the correct answers for the following : **(04 Marks)**
    i) Steam turbine converts _____ in to mechanical energy.
        A) kinetic energy   B) weight   C) velocity   D) potential
    ii) Compounding consists of one set of nozzle and two or more set of moving blades called as
        A) velocity compounding   B) pressure compounding
        C) pressure velocity compounding   D) velocity pressure compounding
    iii) Pelton wheel is example for
        A) reaction water turbine   B) low head water turbine
        C) impulse water turbine   D) steam turbine
    iv) Combustioned gas is directly converted into the mechanical power called as
        A) reaction turbine   B) impulse turbine
        C) open or closed gas turbine   D) steam turbine
   b. Explain the principle and working of reaction turbine. **(06 Marks)**
   c. With the help of a neat sketch, explain the working of a Francis turbine. **(06 Marks)**
   d. Explain the working principle of a gas turbine on closed cycle. **(04 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2.Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

3 a. Choose the correct answers for the following :   (04 Marks)
   i)   Otto cycle engine is an example for
         A) petrol engine   B) diesel engine   C) dual engine   D) all of these
   ii)   4 stroke engine has power stroke in _____.
         A) every cycle   B) every alternative cycle
         C) every third cycle   D) in all the revolution of the crank shaft
   iii) In two stroke petrol engine compressive ratio is approximately
         A) 1:22   B) 1:11   C) 1:1   D) 1:80
   iv)   Diesel cycle engine is also called as
         A) constant volume cycle   B) constant pressure cycle
         C) dual cycle   D) all of these
   b. Explain with a neat figure 4 stroke petrol engine.   (08 Marks)
   c. Differentiate between 4 stroke and 2 stroke engine.   (04 Marks)
   d. Give advantages of two stroke engine over four stroke engine.   (04 Marks)

4 a. Choose the correct answers for the following :   (04 Marks)
   i)   Good refrigerant should be
         A) high boiling point   B) flammable
         C) low thermal conductivity   D) non-toxic
   ii)   Unit of refrigeration is
         A) COP of refrigeration   B) Ton of refrigeration
         C) Ampere of refrigeration   D) None of these
   iii) Ammonia refrigerant is used in _____ refrigerator.
         A) Household   B) absorption
         C) vapour compression   D) air conditioner
   iv)   Function of the throttle valve in a refrigerator is to
         A) reduce the pressure
         B) increase the pressure
         C) converts vapour refrigerant into liquid
         D) liquid refrigerant into vapour conversion
   b. Describe with a neat sketch, the working of vapour absorption refrigerator.   (08 Marks)
   c. With a neat sketch of a room air-conditioner, explain its working principle. (08 Marks)

PART – B

5 a. Choose the correct answers for the following :   (04 Marks)
   i)   Function of the lathe is
         A) produce cylindrical parts   B) produce key holes
         C) produce slots   D) all of these
   ii)   Speed lathe is example for
         A) geared head lathe   B) simple lathe   C) universal lathe   D) caption lathe
   iii) Reaming operation is a ._____.
         A) drill operation   B) lathe operation
         C) milling operation   D) grinding operation
   iv)   Radial drilling machine is used for
         A) small works   B) medium works
         C) medium and heavy works   D) all of these
   b. With a neat sketch, explain construction and operation of radial drilling machine. (08 Marks)
   c. Explain with figure taper turning with compound slide swiveling method.   (08 Marks)

6 a. Choose the correct answers for the following : **(04 Marks)**
   i) Milling machine removes the metal using
      A) multi point cutting tool   B) single point cutting tool
      C) abrasive wheel   D) drill bit
   ii) Work piece and cutting tool moves in the same direction called as
      A) up milling   B) down milling
      C) combination of up and down milling D) all of these
   iii) Emery is an example for _____ abrasive.
      A) natural   B) synthetic   C) artificial   D) clay
   iv) Center less grinding is used for
      A) long work piece   B) short work piece
      C) both long and short work piece D) internal grinding
   b. With the help of a neat sketch, explain the working of a universal milling machine. **(08 Marks)**
   c. Explain with figure working principle of center less grinding machine. **(06 Marks)**
   d. Explain any two milling operation. **(02 Marks)**

7 a. Choose the correct answers for the following : **(04 Marks)**
   i) Fusion welding is an example for
      A) resistance welding   B) arc welding
      C) forge welding   D) Thermit pressure welding
   ii) Copper base filler metal is used for
      A) soft soldering   B) hard soldering   C) brazing   D) welding
   iii) Grease is an example for _____ lubrication.
      A) solid   B) liquid   C) semi liquid   D) all of these
   iv) Collar bearing is also known as
      A) journal bearing   B) thrust bearing   C) foot step bearing   D) radial bearing
   b. Explain the principle of arc welding with a figure. **(06 Marks)**
   c. Name the three types of oxy-acetylene flame. Explain the application of each of them.
  (06 Marks)
   d. Describe the drop feed oil lubrication with neat sketches. **(04 Marks)**

8 a. Choose the correct answers for the following : **(04 Marks)**
   i) Jockey pulley is used for
      A) increase arc of contact   B) increase speed
      C) decrease arc of contact   D) decrease in speed
   ii) When a belt moves forward without carrying pulleys called _____.
      A) slip   B) creep
      C) both slip and creep   D) all of these
   iii) Chain drive is used in
      A) center distance less than 8m   B) high power transmission
      C) positive power transmission   D) all of these
   iv) Spur gear is example for
      A) parallel axis   B) non-parallel axis   C) co-axial   D) non-intersecting
   b. With a neat sketch, explain past and loose pulley. **(06 Marks)**
   c. Explain following gears:
   i) Spur gear   ii) Helical gear   iii) Bevel gear   iv) Rack and pinion   **(06 Marks)**
   d. In a compound train of wheels, the wheels A, B, C and D have 15, 30, 20 and 40 teeth respectively. The wheels B and C are keyed to the same spindle. If the wheel A runs at 400 rpm, find the speed of the wheel D. Sketch the arrangements. **(04 Marks)**

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10ELN15/25

First/Second Semester B.E. Degree Examination, Dec.2013/Jan.2014
Basic Electronics

Time: 3 hrs.

Max. Marks:100

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Answer all objective type questions only on OMR sheet page 5 of the answer booklet.*
3. *Answer to objective type questions on sheets other than OMR will not be valued.*

PART – A

1 a. Choose the correct answers for the following :
   i)   The knee voltage of a silicon diode is
        A) 0.3V   B) 0.5V   C) 0.7V   D) None of these
   ii) The efficiency of full waves rectifier is about _____ %
        A) 40.6   B) 0.46   C) 1.21   D) 81.2
   iii) The missing terms in the forward diode current is $I_F = I_o[e^{V/V_t} - 1]$
        A) V_R B) η C) V_S D) e
   iv) The zener diode is mainly used in
        A) Comparator   B) Regulator   C) Multivibrator   D) None of these
   (04 Marks)

 b. Discuss the behaviour of p-n junctions under:
     i) No bias; ii) Forward bias; iii) Reverse bias. **(06 Marks)**

 c. Explain the operation of full wave bridge rectifier with neat circuit diagram and waveforms. **(06 Marks)**

 d. A zener diode has a breakdown voltage of 10V. It is supplied from a voltage source varying between 20–40V in series with resistance of 820Ω, using an ideal zener diode model obtain minimum and maximum zener currents. **(04 Marks)**

2 a. Choose the correct answers for the following :
   i)   When transistor operated in cut off and saturation, it acts like
        A) a linear amplifier   B) a switch
        C) a variable capacitor   D) a variable resistor
   ii) If the base emitter junction is open, what is the collector current
        A) 1 mA   B) 2mA   C) 10mA   D) 0.0
   iii) The _____ transistor is used for impedance matching
        A) C-B   B) C-E   C) C-C   D) None of these
   iv) α of a transistor is 0.99 calculate β
        A) β = 0.9   B) β = 90   C) β = 99   D) β = 0.09
   (04 Marks)

 b. Draw the common emitter circuit and sketch the output characteristics, explain active region, cutoff region and saturation region by indicating them on the characteristic curve. **(08 Marks)**

 c. With a neat circuit diagram explain the working of transistor used as voltage amplifier. **(04 Marks)**

 d. For a certain transistor, 99.6% of the carriers injected into the base cross the collector-base junction. If the leakage current is 5μA and the collector current is 20mA, calculate: i) The value of α; ii) the emitter current. **(04 Marks)**

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3 a. Choose the correct answers for the following :
   i)   The best biasing stability is achieved by using _____ biasing method.
        A) Fixed   B) Collector to base
        C) Voltage divider   D) None of these
   ii) In self bias or emitter bias circuit _____ is connected between emitter and ground.
        A) Inductor   B) Capacitor
        C) Resistor   D) Zener diode
   iii) The stability factor is given by
        A) $\dfrac{dI_{CO}}{dI_E}$ B) $\dfrac{dI_B}{dI_{CO}}$
        C) $\dfrac{dI_C}{dI_{CO}}$ D) $\dfrac{dI_C}{dI_{CO}}$
   iv) The operating point must be _____ for the proper operation of transistor
        A) High   B) Stable
        C) Increasing   D) Decreasing
   (04 Marks)

 b. With a neat circuit diagram, explain the working of an collector-to-base bias circuit using an npn transistor and derive the equation for I_B. **(06 Marks)**

 c. Determine the operating point for a silicon transistor biased by base bias method with β = 100, R_B = 500KΩ, R_C = 2.5KΩ and V_{CC} = 20V. Also draw the load line. **(06 Marks)**

 d. Derive the stability factor S for base bias circuit. **(04 Marks)**

4 a. Choose the correct answers for the following :
   i)   With gate open, if the supply voltage exceeds the break over voltage of SCR, then SCR will conduct
        A) False   B) True
        C) Only for D.C   D) Only for A.C
   ii) The SCR is a _____ device
        A) NPN   B) PNP
        C) PNPN   D) PNN
   iii) A relaxation oscillator uses _____
        A) MOSFET   B) SCR
        C) UJT   D) BJT
   iv) FET is a _____ controlled device
        A) Voltage   B) Current
        C) Power   D) None of these
   (04 Marks)

 b. Explain the construction of n-channel JFET and give its symbol. **(06 Marks)**

 c. Write and explain the equivalent circuit of UJT. **(05 Marks)**

 d. Explain the two transistor model of SCR. **(05 Marks)**

7 a. Choose correct answers for the following : (04 Marks)

i) Which of the following is invalid BCD code?
A) 0011   B) 1101
C) 0101   D) 1001

ii) Given the number $(8BF)_{16}$, what is the positional weight of the 8?
A) 16   B) 256
C) 4096   D) 8192

iii) $(64)_{16} - (46)_8$ in binary is
A) 111101101 B) 111101100
C) 111110   D) 1100110

iv) The relation between carrier power and total power in an AM wave _____

A) $P_C = P_T\left(1+\dfrac{m^2}{4}\right)$ B) $P_C = P_T\left(1+\dfrac{m^2}{2}\right)$

C) $P_T = P_C\left(1+\dfrac{m^2}{4}\right)$ D) $P_T = P_C\left(1+\dfrac{m^2}{2}\right)$

b. Determine the value of base x, if i) $(225)_x = (341)_8$; ii) $(211)_x = (152)_8$. (06 Marks)

c. Perform subtraction using 2's complement method 1101 – 1010. (04 Marks)

d. Draw the block diagram of super heterodyne receiver and explain the functions of each block. (06 Marks)

8 a. Choose the correct answers for the following : (04 Marks)

i) De Morgan's theorem states that $\overline{A+B}$ is
A) $\overline{A}+\overline{B}$ B) $\overline{A}.\overline{B}$
C) $\overline{AB}$ D) $\overline{A}+B$

ii) Universal gates are _____ and _____.
A) NOT and OR   B) AND and OR
C) NAND and NOR   D) XOR and XNOR

iii) For which gate when the two inputs A and B are equal the output is zero and otherwise one?
A) NAND   B) NOR
C) EXNOR   D) EXOR

iv) An half adder has two inputs and _____ outputs
A) ONE   B) TWO
C) THREE   D) None of these

b. Implement EX-NOR gate using only NOR gates. (06 Marks)

c. Simplify $AB+\overline{AC}+A\overline{B}C(AB+C)$. (06 Marks)

d. Implement full adder using two half adders and one OR gate. Write the equations for sum and C_{out}. (06 Marks)

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PART – B

5 a. Choose the correct answers for the following : (04 Marks)

i) Oscillator uses _____ type of feedback
A) Positive   B) Negative
C) Reverse   D) None of these

ii) The total phase shift around a loop must be _____ for the sustained oscillations
A) 180°   B) 360°
C) 90°   D) 270°

iii) The frequency response is a graph of _____
A) frequency v_s current gain   B) frequency v_s voltage gain
C) frequency v_s output voltage   D) frequency v_s input voltage

iv) In RC coupled amplifier the d.c component is blocked by _____
A) Load resistance R_L B) Coupling capacitor, C_C
C) R_B D) The transistor

b. With a neat circuit diagram, explain the working of a two stage capacitor coupled CE amplifier. (08 Marks)

c. Explain with the help of circuit diagram the working of an RC phase shift oscillator using transistor. (06 Marks)

d. Find the frequency of the oscillations of transistorized Colpitts oscillator having tank circuit parameters as $C_1 = 150pF$, $C_2 = 1.5nF$ and $L = 50\mu H$. (02 Marks)

6 a. Choose the correct answers for the following : (04 Marks)

i) In an inverting amplifier there is _____ phase shift between input and output.
A) 0°   B) 90°
C) 180°   D) 360°

ii) Ideally open loop gain of op-amp is _____
A) 0   B) 1
C) ∞   D) Negative

iii) When op-amp used as integrator with input as square wave the output will be _____
A) Ramp   B) Triangular wave
C) Cosine wave D) Step

iv) Lissajous figures are used to measure _____ difference between sinusoidal signals
A) Phase   B) Amplitude
C) Frequency D) None of these

b. Write the ideal op-amp characteristics. (06 Marks)

c. Show with a circuit diagram how an op-amp can be used as differentiator. (06 Marks)

d. Explain how current measurement is done using CRO. (04 Marks)

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10ELE15/25

First/Second Semester B.E. Degree Examination, Dec.2013/Jan.2014

Basic Electrical Engineering

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
2. *Answer all objective type questions only in OMR sheet page 5 of the answer booklet.*
3. *Answer to objective type questions on sheets other than OMR will not be valued.*

PART – A

1 a. Choose the correct answers for the following :
  i) The polarity of voltage drop across a resistor is determined by _____
    A) the value of resistor   B) the value of current
    C) direction of current in resistor   D) the polarity of source
  ii) Three resistors of 4 Ω, 6 Ω and 9 Ω are connected in parallel in a network. Maximum power will be consumed by _____
    A) 4 Ω resistor   B) 6 Ω resistor   C) 9 Ω resistor   D) all resistors
  iii) The magnitude of statically induced e.m.f. depends on
    A) the coil resistance   B) the flux magnitude
    C) the rate of change of flux   D) all of these
  iv) The direction of induced e.m.f. in a conductor (or coil) can be determined by _____.
    A) Work law   B) Ampere's law
    C) Fleming's right hand rule   D) Fleming's left hand rule
                                                                              (04 Marks)
  b. Derive equation for energy stored in magnetic field.   **(04 Marks)**
  c. Find the value of resistance 'R' as shown in Fig.Q1(c), so that current drawn from the source is 250 mA. All the resistor values are in ohm.   **(06 Marks)**
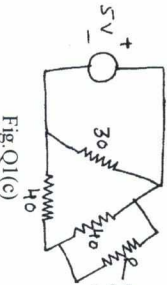

Fig.Q1(c)

  d. Coils A and B in a magnetic circuit have 600 and 500 turns respectively. A current of 8A in coil A produces a flux of 0.04 Wb. If coefficient of coupling is 0.2, calculate :
    i) Self inductance of coil A, with B open circuited.
    ii) Flux linkage with coil B.
    iii) The average emf induced in coil B when the flux with it changes from zero to full value in 0.02 second.   **(06 Marks)**

2 a. Choose the correct answers for the following :
  i) A coil is rotating in the uniform magnetic field of an 8 pole generator. In one revolution of the coil, the number of cycles generated by the voltage is
    A) one   B) two   C) four   D) eight
  ii) The average value of sin θ over complete cycle is
    A) +1   B) –1   C) zero   D) ½

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  iii) In the circuit shown in Fig.Q2(a)(iii), the potential difference across the various elements are shown. What is the source voltage, V?
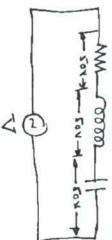

Fig.Q2(a)(iii)

    A) 50 V   B) 100 V   C) zero   D) 150 V
  iv) If two phasors A = 60⌊40°, B = (6 + j0), then A/B = _____.
    A) 360⌊40°   B) 60⌊40°   C) 10⌊40°   D) 10⌊–40°
                                                                              (04 Marks)
  b. Derive r.m.s. value of sinusoidal voltage in terms its maximum value.   **(04 Marks)**
  c. An inductor coil is connected to supply of 250 V at 50 Hz and takes a current of 5A. The coil dissipates 750 W. Calculate power factor, resistance and inductance of the coil.   **(06 Marks)**
  d. A capacitor of 50 μF shunted across a non inductive resistance of 100 Ω is connected in series with a resistor of 50 Ω to a 200 V, 50 Hz supply. Find circuit current and power factor.   **(06 Marks)**

3 a. Choose the correct answers for the following :
  i) The advantage of star-connected supply system is that
    A) line-current is equal to phase current
    B) line voltage is equal to √3 phase voltage
    C) two voltage can be used
    D) it is simple arrangement
  ii) The phase sequence R Y B denotes that
    A) the e.m.f.of R leads Y by 120°   B) the e.m.f of Y lags R by 120°
    C) the e.m.f of Y leads B by 120°   D) all of these
  iii) In a three-phase power measurement by two Wattmeter method, both Wattmeters reads the same value. The power factor of the load must be
    A) unity   B) 0.707 lag   C) 0.707 lead   D) zero
  iv) Three phase apparent power is equal to
    A) √3 V_LI_L   B) √3 V_LI_L cos φ   C) √3 V_LI_L sin φ   D) V_LI_L
                                                                              (04 Marks)
  b. With the aid of a phasor diagram obtain the relationship between the line and phase values of voltages in a three phase star connected system.   **(06 Marks)**
  c. State advantages of three-phase system over a single-phase system.   **(04 Marks)**
  d. Three identical coils, each having a resistance of 10 Ω and a reactance of 10 Ω are connected in delta, across 400 V, 3-phase supply. Find the line current and the readings on the two Wattmeters connected to measure the power.   **(06 Marks)**

4 a. Choose the correct answers for the following :
  i) Dynamometer type instruments can be used for
    A) A.C. only   B) D.C. only
    C) both A.C and D.C   D) none of these
  ii) The most commonly used induction type instrument is _____.
    A) Voltmeter   B) Ammeter   C) Watt-hour meter   D) Wattmeter
  iii) Most modern wiring system for domestic and commercial installation is
    A) Cleat wiring   B) Wooden-Batten wiring
    C) Wooden-casing wiring   D) Conduit wiring
  iv) The fuse wire for smaller current rating (up to 10 A) are made of
    A) Lead-tin alloy   B) Copper   C) Lead   D) Aluminium

4 b. Explain with a neat sketch, single phase induction type energy meter. (06 Marks)

c. Explain staircase wiring. (04 Marks)

d. With a neat sketch, explain plate earthing. (06 Marks)

PART – B

5 a. Choose the correct answers for the following : (04 Marks)

i) The number of parallel paths in the armature winding of a four pole, wave connected dc machine having 28 coil-sides is
A) 28   B) 14   C) 4   D) 2

ii) The e.m.f generated by a given dc generator depends upon
A) the flux only   B) the speed only
C) both flux and speed   D) the terminal voltage

iii) The back e.m.f in a dc motor is given as
A) $V+I_aR_a$ B) $V-I_aR_a$ C) V D) I_aR_a

iv) The speed of the d.c. motor is
A) directly proportional to both its back emf and flux
B) inversely proportional to both its back emf and flux
C) directly proportional to flux but inversely proportional to its back emf
D) directly proportional to its back emf but inversely proportional to flux

b. Explain working of d.c. motor and hence derive an equation for torque. (08 Marks)

c. An 8-pole generator has 500 armature conductors and has a useful flux per pole of 0.065 Wb. What will be the e.m.f generated if it is lap connected and runs at 1000 rpm? What must be the speed at which it is to be driven to produce the same emf if it is wave wound? (08 Marks)

6 a. Choose the correct answers for the following : (04 Marks)

i) The core of a transformer is assembled with laminated sheets so as to
A) reduce hysteresis loss
B) reduce Eddy current loss
C) both hysterisis and Eddy current loss
D) copper loss

ii) A single phase, 5 kVA, 200 V/100 V, transformer has rated primary and secondary currents at rated voltage
A) 25 A and 50 A   B) 50 A and 25 A
C) 12.5 A and 62.5 A   D) 62.5 A and 12.5 A

iii) If the fuel load core loss of a transformer is 100 W, its core loss at half load will be
A) 200 W   B) 100 W   C) 50 W   D) 25 W

iv) A transformer operates at maximum efficiency, when
A) core losses minimum
B) copper loss minimum
C) core loss = copper loss
D) none of these

b. Derive expressions for the r.m.s values of induced voltages in the two windings of a single phase transformer connected to a sinusoidal supply. (05 Marks)

c. Deduce the condition for maximum efficiency in a single-phase transformer. (05 Marks)

d. A transformer is rated at 100 kVA. At full load its copper loss is 1200 W and its iron loss is 960 W. Calculate:
i) The efficiency at full load, OPF.
ii) The efficiency at half load, 0.8 pf.
iii) The load kVA at which maximum efficiency will occur. (06 Marks)

7 a. Choose the correct answers for the following : (04 Marks)

i) In synchronous generators
A) the field poles are stationary and the armature conductors rotate
B) the armature conductors are stationary and the field poles rotate
C) field and armature both are stationary
D) none of these

ii) A 4-pole, 1200 rpm alternater will generate an emf at a frequency of
A) 60 Hz   B) 50 Hz   C) 40 Hz   D) 25 Hz

iii) Full pitch windings have coil span of
A) 180°   B) 90°   C) 270°   D) 360°

iv) The current from an alternator is taken out to external load circuit through
A) commutator segments   B) slip-rings
C) carbon brushes   D) solid connection

b. By means of a neat diagram, describe the main parts of an alternator with their functions. (08 Marks)

c. A 3-phase, 6-pole, star-connected alternator revolves at 1000 rpm. The stator has 90 slots and 8 conductors per slot. The flux per pole is 0.05 Wb (sinusoidally distributed). Calculate the voltage generated by the machine if the winding factor is 0.96 line and phase value. (08 Marks)

8 a. Choose the correct answers for the following : (04 Marks)

i) In a three phase induction motor
A) rotor conductors are open circuited
B) rotor conductor are short circuited
C) stator winding is open
D) none of these

ii) The relation between N_s, f and P of three-phase inductor is
A) $N_s = \dfrac{P}{120f}$ B) $N_s = \dfrac{120P}{f}$ C) $f = \dfrac{PN_s}{120}$ D) $f = \dfrac{120N_s}{P}$

iii) When speed of the induction motor is zero, its slip is
A) zero   B) 0.5   C) one   D) infinity

iv) The number of slip rings in a three phase wound rotor induction motor is
A) 3   B) 4   C) 9   D) 2

b. Explain the principle of operation of a three phase induction motor. (05 Marks)

c. With the help of neat circuit diagram, explain star-delta starter. (06 Marks)

d. A 3-phase, 6-pole, 50 Hz induction motor has a slip of 1% at no load, and 3% at full load. Determine: i)synchronous speed ; ii) no-load speed ; iii) full-load speed ; iv) frequency of rotor current at stand still ; v) frequency of rotor current at full load. (05 Marks)

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Question Paper Version : A

I / II Semester B.E Degree Examination, Dec.2013/Jan.2014
CONSTITUTION OF INDIA AND PROFESSIONAL ETHICS
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]   [Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty questions, each question carries one mark.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. **For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.**

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. The basic feature of the Indian constitution is found in :
   a) Fundamental duties
   b) Fundamental rights
   c) Preamble
   d) Directive principles of state policy

2. Original constitution classified fundamental rights into seven categories but now there are,
   a) Eight
   b) Six
   c) Regrouped into social, economic and political
   d) Five

3. The final stage of the election process is:
   a) Polling
   b) Counting of votes
   c) Announcement of results
   d) None of these

4. The Indian Federal system is based on the Federal system of,
   a) Canada   b) USA   c) France   d) Newzealand

5. Engineers must:
   a) Recognize the value of a code of Ethics
   b) Support a code of ethics
   c) Look upon a code of ethics as a sacred writ
   d) Both (a) and (b).

6. The President of India takes the Oath of office before the:
   a) Vice President
   b) Prime minister
   c) Chief justice of supreme court
   d) Speaker of Lok sabha

7. 'Judicial Review' means:
   a) Reviewing the lower court judgement
   b) Reviewing the laws passed by the legislature
   c) Examining the actions of executives
   d) Advising the president of India.

-A1-

8. India is known as Parliamentary Democracy because:
   a) Powers have been clearly distributed between center and states.
   b) President is elected indirectly.
   c) MPs are directly elected by the people.
   d) Executive is responsible to the parliament.

9. One of the basic attitudes towards responsibility is:
   a) Vigilant view   b) Minimalist view   c) Moralistic view   d) Maximalist view

10. The foreign policy of the Government is shaped by the :
    a) Cabinet   b) Parliament   c) Prime Minister   d) Vice-President

11. The first session of Parliament is called:
    a) Primary   b) Winter   c) Budget   d) Monsoon

12. Uniform civil code means:
    a) A code related to individual's public life.
    b) A codified law applicable to all persons of India irrespective of their religion
    c) A civil procedure code
    d) A code meant for Hindu only.

13. The Vice President is having power:
    a) To sign bills passed by Rajya Sabha   b) To preside over Rajya Sabha.
    c) To nominate two members to Rajya Sabha d) To Promulgate ordinance

14. Parliament of India consists of,
    a) Lok Sabha   b) Lok Sabha and Rajya Sabha
    c) Only Rajya Sabha   d) Lok Sabha, Rajya Sabha & the President of India

15. The tenure of members of Legislative council is:
    a) 3 years   b) 5 years   c) 6 years   d) 4 years

16. 'Respite' means:
    a) Awarding lesser punishment   b) Death due to suffocation
    c) Painless death   d) Death due to drowning

17. This is not dishonesty in science and engineering,
    a) Cooking   b) Forging   c) Trimming   d) Blending

18. A National emergency can remain in operation with the approval of Parliament for:
    a) An indefinite period   b) A maximum period of six months
    c) A maximum period of one year   d) A maximum period of three years.

19. As applied to engineering research and testing retaining the contradictory statement, discarding the rest is called:
    a) Trimming   b) Scanning   c) Cooking   d) Skimming

20. The Chief Justice and other judges of the high court are appointed by:
    a) President   b) Chief Minister
    c) Prime Minister   d) Governor

21. The concept of secular state implies:
    a) No religion   b) Dictatorship
    c) Neutrality of religion   d) Adoption of a single religion.

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22. The other names for Rajya Sabha are:
a) Upper house
b) Council of states
c) A Federal house
d) All the above

23. The term 'Ethics' is derived from:
a) Ethical in English
b) 'Ethic' in Latin
c) Custom
d) Ethics in Greek.

24. The Governor of a state acts as:
a) Real executive of a state
b) Agent of President
c) Secretary of president
d) Advisor to central government

25. Jobs are reserved for SCs and STs,
a) For promotions
b) For appointments
c) For appointments and promotions
d) On the basis of their annual income

26. How many subjects are there in the central, state and concurrent list:
a) 97, 66 and 47
b) 47, 66 and 98
c) 97, 47 and 65
d) 47, 96 and 55

27. Village Panchayats (Article – 40) are the best examples for India's _____ form of government.
a) Republican
b) Secular
c) Sovereign
d) Democratic

28. The fundamental duties of Indian citizens were incorporated in the constitution in:
a) 1952
b) 1976
c) 1980
d) 1985

29. The aim of the Directive principles of state policy is to establish:
a) Capitalist state in our country
b) Communist state in our country
c) Welfare state in the country
d) All of these

30. Sexual harassment of working women in working places is violation of,
a) Right to profession
b) Right to reputation
c) Right to personal liberty
d) Right to life

31. The chief minister of a state is appointed by the:
a) Speaker
b) Chief justice of high court
c) Prime minister
d) Governor

32. Exclusion of Creamy layer makes a backward class:
a) Socially backward
b) Truly backward
c) More backward
d) Economically backward

33. Special majority means more than,
a) 50% majority
b) Two-third majority
c) 75% majority
d) 60% majority

34. One of the ways of misusing the truth is:
a) Exaggerating the truth
b) Making wrong statement
c) Making confused statement
d) Failure to seekout the truth

35. The constitution empowers state government to make special law for:
a) Workers
b) Teachers
c) Women and Children
d) Farmers

36. The Controller and Auditor General acts as the,
    a) Guardian of public finances
    b) Chief legal advisor of the government
    c) Guardian of public interests
    d) Guardian of fundamental rights

37. The system of legislature in the state of Karnataka is:
    a) Bicameral   b) Unicameral   c) Cameral   d) Multicameral

38. Voting age of citizens is changed from 21 to 18 years by _____ Constitutional Amendment Act:
    a) 42nd b) 56th c) 61st d) 76th

39. Writ of prohibition cannot be issued against the :
    a) Judicial functions
    b) Legislative functions
    c) Acts of lower courts
    d) Quasi – Judicial functions

40. 'Fault Tree' is used:
    a) To trace the risk
    b) To assess the accuracy
    c) To trace the result
    d) To assess the risk

41. State emergency is declared by the:
    a) Chief minister   b) Governor   c) Lok Sabha   d) President

42. The Mandal commission for backward classes was setup in,
    a) 1987   b) 1978   c) 1996   d) 1986

43. According to 44th Amendment of 1978 the right to property was emitted as a fundamental right and made it a _____
    a) Social right   b) Legal right   c) Universal right   d) None of these

44. Group thing: _____
    a) Gives a good result
    b) Leads to a better result
    c) Widens our knowledge
    d) Is an impediment to responsibility

45. Our constitution prohibits :
    a) Untouchability   b) Freedom   c) Liquor   d) Politics

46. The president can appoint to Lok Sabha from Anglo Indian community: _____
    a) Two persons   b) One person   c) Five person   d) Three persons

47. 74th Amendment of the constitution refers to :
    a) Rural local bodies
    b) Right to property
    c) Urban local bodies
    d) None of these

48. Which article of the constitution provides protection to the civil servants?
    a) 315   b) 311   c) 368   d) 388

49. The party system in India can be described as:
    a) Bi-party   b) Majority party   c) Single party   d) Multi party

50. The phrase economic justice is found in,
    a) Fundamental rights and fundamental duties.
    b) Preamble and Directive principles of state policy
    c) Fundamental duties and directive principles of state policy
    d) Fundamental rights and fundamental duties.

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Question Paper Version : A

First/Second Semester B.E Degree Examination, Dec. 2013 / Jan. 2014
Environmental Studies
(COMMON TO ALL BRANCHES)

Time: 2 hrs.]   [Max. Marks: 50

INSTRUCTIONS TO THE CANDIDATES

1. Answer all the fifty questions, each question carries **ONE mark**.

2. Use only **Black ball point pen** for writing / darkening the circles.

3. For each question, after selecting your answer, darken the appropriate circle corresponding to the same question number on the OMR sheet.

4. Darkening two circles for the same question makes the answer invalid.

5. **Damaging/overwriting, using whiteners** on the **OMR** sheets are strictly prohibited.

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1. An ecosystem consist of
   a) Biotic component   b) Abiotic components   c) Both a and b   d) None of these.

2. Percentage of Nitrogen in Earth's atmosphere is
   a) 98 %   b) 21 %   c) 78 %   d) 12 %

3. Eutrophication means
   a) Waste water treatment process   b) Water purification
   c) Enrichment of plant nutrients in water bodies   d) Neutralization of waste water.

4. Largest reservoir of Nitrogen exists in
   a) Hydrosphere   b) Stratosphere   c) Lithosphere   d) Atmosphere

5. Housing has become inaccessible to the poor due to
   a) Increased population   b) High cost   c) Non-availability of land   d) None of these.

6. The major objective of the family welfare programs in India is
   a) Disease control   b) Population growth rate control
   c) Employment generation   d) None of these.

7. World Environmental Day is celebrated every year on
   a) 5th June   b) 5th July   c) 18th July   d) April 22nd.

8. Which part of plant contains nitrogen fixing bacteria
   a) Stems   b) Leaves   c) Roots   d) All of these.

9. Anthropoginal activities means
   a) Natural activities   b) Bacteriological activities
   c) Wild animals activities   d) Human activities.

- A1 -

10. Which of the following is major environmental issue in mining activities?
   a) Air pollution and dust   b) Water pollution   c) Soil Degradation   d) All of these

11. During the last 30 years the percentage of decrease in agricultural land due to Urbanization is about
   a) 40 %   b) 60 %   c) 0 %   d) 30 %.

12. EIA means
   a) Environmental impact assessment   b) Eco – impact assessment
   c) Eco – industrial act   d) Environmental industrial impact.

13. The adverse effect of modern agriculture is
   a) Soil pollution   b) Water pollution   c) Wastes logging   d) All of these

14. Which of the following energy source is less Eco – friendly
   a) Wind   b) Water   c) Solar   d) Thermal

15. Which of the following is NGO?
   a) Public works department   b) Pollution control board
   c) Narmada Bachao Andolan   d) None of these

16. The environmental (protection) act of India was enacted in the year
   a) 1956   b) 1966   c) 1986   d) 1996

17. Environmental protection is the responsibility of
   a) Government of India   b) NGO's   c) Individuals   d) All of these.

18. The country which has the largest number of child laborers in the world is
   a) India   b) Bangladesh   c) China   d) Pakistan

19. Which among the following diseases is not a cause of large scale children's mortality?
   a) Diarrhea   b) Malnutrition   c) Chicken gunya   d) Measles

20. Karnataka State pollution control board was established in the year
   a) 1986   b) 1974   c) 1982   d) 1977

21. Environment education is targeted to
   a) General public   b) Technicians   c) Professionals social groups   d) All of these

22. The ozone depletion in the stratosphere is chiefly caused by the release of
   a) Chlorofluoro carbons   b) Methane   c) Carbon dioxide   d) None of these

23. The pH of acid rain is
   a) Less than 5.7   b) Less than 3.7   c) Less than 1.7   d) Less than 2.7.

24. Dental cavities in children may be caused due to water supplies deficient in
   a) Calcium   b) Fluorides   c) Iron   d) None of these

25. Loss of water content through the plants into the atmosphere is called
    a) Evaporation   b) Vaporization   c) Transpiration   d) Hydraulic cycle

26. What is the Max. allowable concentration of Iron content in drinking water as per BIS.
    a) 0.5 mg/ℓ   b) 1.0 mg/ℓ   c) 1.5 mg/ℓ   d) 2.0 mg/ℓ

27. The volume of nitrogen present in the troposphere is
    a) 85%   b) 78%   c) 21%   d) 5%

28. Cholera, Typhoid, Hepatitis – A and E are the diseases caused due to
    a) Solar radiation   b) Contaminated water
    c) Radioactivity   d) Electromagnetic radiation

29. Hydraulic cycle is related to
    a) Water and electricity   b) Water cycle and balance
    c) Water characterization   d) Hydropower

30. What is the percentage of fresh water available in lakes and streams
    a) 0.0001%   b) 0.001%   c) 0.01%   d) 0.1%

31. Which is considered as energy source of future?
    a) Wind   b) Ocean   c) Hydrogen   d) None of these

32. Bhopal gas tragedy happened in the year
    a) Dec 1984   b) Dec 1983   c) Dec 1994   d) Dec 1986

33. Renewable energy is
    a) Primary source   b) Secondary source   c) Tertiary source   d) None of these

34. About 30% of the country's coal deposits are found in
    a) Karnataka   b) Tamil Nadu   c) Kashmir   d) Bihar and Orissa

35. Cow dung can be used
    a) As a manure   b) For production of biogas   c) Both (a) and (b)   d) None of these

36. Liquefied petroleum gas is a mixture of
    a) Methane and ethane   b) Propane and butane
    c) Methane and butane   d) Methane and propane.

37. Best environmental clean alternative fuel is
    a) CNG   b) Diesel   c) Coal   d) Petrol

38. Nuclear power plant in Karnataka is located at
    a) Bhadravathi   b) Sandur   c) Kaiga   d) Mandya

39. Air pollution from automobiles can be controlled by fitting
    a) Electrostatic precipitator   b) Wet scrubber
    c) Catalytic converter   d) All of these

40. Which of the following is a natural source of environmental pollution?
    a) Sewage   b) Industries   c) Automobiles   d) Earthquake

41. Liquid waste generated from bathrooms and kitchens are called
    a) Domestic sewage   b) Run off   c) Sallages   d) All the these

42. The max average permissible noise levels during day time hours as per environment protection act in India is
    a) 30dB   b) 45dB   c) 50dB   d) 55 dB

43. Demography is the study of
    a) Animal behaviour   b) Geography   c) Rivers   d) Population growth

44. Global warming means
    a) Increase in Earth's temperature   b) Increase in solar radiation
    c) Acid rain   d) All of these

45. The protocol that reduces green house gas emission is
    a) Kyoto protocol   b) Montreal protocol   c) Cartagena protocol   d) Vienna protocol

46. Important sources of land pollution are
    a) Industrial wastes   b) Agricultural wastes   c) Both (a) and (b)   d) None of these

47. The main impact of urbanization on plant and animal life is
    a) Increase in species   b) Mutation in species   c) Both (a) and (b)   d) Loss of species

48. What is the maximum allowable concentration of fluorides in drinking water
    a) 3.0 mg/ℓ   b) 2.5 mg/ℓ   c) 2.0 mg/ℓ   d) 1.5 mg/ℓ

49. Acid rain are more prominent in
    a) Temperate regions   b) Tropical regions
    c) Arid regions   d) None of these

50. In which year Hon'ble Supreme Court of India made environmental education compulsory subject at all the level of education.
    a) 2000   b) 2003   c) 2001   d) 2002

Second Semester B.E. Degree Examination, Dec.2013/Jan.2014
Engineering Mathematics – II

Time: 3 hrs.   Max. Marks:100

Note: 1. *Answer any FIVE full questions, choosing at least two from each part.*
       2. *Answer all objective type questions only on OMR sheet page 5 of the answer booklet.*
       3. *Answer to objective type questions on sheets other than OMR will not be valued.*

PART – A

1   a.   Choose the correct answers for the following :   **(04 Marks)**

     i)   Suppose the equation to be solved is of the form, $y = f(x, \phi)$ then differentiating x we get equation of the form,

       A) $\phi\left(x, p, \dfrac{dp}{dy}\right) = 0$ B) $\phi\left(y, p, \dfrac{dp}{dx}\right) = 0$ C) $\phi(x, y, p) = 0$ D) $\phi(x, y, 0) = 0$

     ii)   The general solution of the equation, $p^2 - 3p + 2 = 0$ is,

       A) $(y + x - c)(y + 2x - c)$ B) $(y - x - c)(y - 2x - c) = 0$
       C) $(-y - x - c)(y - 2x - c) = 0$ D) $(y - x - c)(y + x - c) = 0$

     iii)   Clairaut's equation is of the form,

       A) $x = py + f(p)$ B) $y = p^2 + f(p)$ C) $y = px + f(p)$ D) None of these

     iv)   Singular solution of $y = px + 2p^2$ is,

       A) $y^2 + 8y = 0$ B) $x^2 - 8y = 0$ C) $x^2 + 8y - c = 0$ D) $x^2 + 8y = 0$

  b.   Solve $p^2 + 2p \cosh x + 1 = 0$.   **(04 Marks)**

  c.   Find singular solution of $p = \sin(y - xp)$.   **(06 Marks)**

  d.   Solve the equation, $y^2(y - xp) = x^4 p^2$ using substitution $X = \dfrac{1}{x}$ and $Y = \dfrac{1}{y}$.   **(06 Marks)**

2   a.   Choose the correct answers for the following :   **(04 Marks)**

     i)   A second order linear differential equation has,

       A) two arbitrary solution   B) One arbitrary solution
       C) no arbitrary solution   D) None of these

     ii)   If 2, 4i and -4i are the roots of A.E of a homogeneous linear differential equation then its solution is,

       A) $e^x + e^x(\cos 4x + \sin 4x)$ B) $C_1 e^{2x} + C_2 \cos 4x + C_3 \sin 4x$
       C) $C_1 e^{2x} + C_2 e^x \cos 4x + C_3 e^x \sin 4x$ D) $C_1 e^{2x} \cos 4x + C_2 e^{2x} \sin 4x$

     iii)   P.I. of $(D + 1)^2 y = e^{-x+3}$

       A) $\dfrac{x^2}{2}$ B) $x^3 e^x$ C) $\dfrac{x^3}{3} e^{-x+3}$ D) $\dfrac{x^2}{2} e^{-x+3}$

     iv)   Particular integral of $f(D)y = e^{ax}V(x)$ is,

       A) $\dfrac{e^{ax}V(x)}{f(D)}$ B) $e^{ax}\dfrac{1}{f(D)}[V(x)]$ C) $e^{ax}\dfrac{1}{f(D+a)}[V(x)]$ D) $\dfrac{1}{f(D+a)}[e^{ax}V(x)]$

  b.   Solve $\dfrac{d^3 y}{dx^3} - 3\dfrac{d^2 y}{dx^2} + 3\dfrac{dy}{dx} - y = 0$.   **(04 Marks)**

  c.   Solve $y'' - 3y' + 2y = 2\sin x \cos x$ **(06 Marks)**

  d.   Solve the system of equation, $\dfrac{dx}{dt} - 2y = \cos 2t$, $\dfrac{dy}{dt} + 2x = \sin 2t$.   **(06 Marks)**

3 a. Choose the correct answers for the following : **(04 Marks)**

i) In $x^2y'' + xy' - y = 0$ if $e^t = x$ then we get x^2y'' as,

A) $(D-1)y$ B) $(D+1)y$ C) $D(D+1)y$ D) None of these

ii) In second order homogeneous differential equation, $P_0(x)y'' + P_1(x)y' + P_2(x)y = 0$, $x = a$ is a singular point if,

A) $P_0(a) > 0$ B) $P_0(a) \neq 0$ C) $P_0(a) = 0$ D) $P_0(a) < 0$

iii) The general solution of $x^2\dfrac{d^2y}{dx^2} + x\dfrac{dy}{dx} - y = 0$ is,

A) $y = C_1x - C_2\dfrac{1}{x}$ B) $C_1x + C_2\dfrac{1}{x}$ C) $C_1x + C_2x$ D) $C_1x - C_2x$

iv) Frobenius series solution of second order linear differential equation is of the form,

A) $x^m\sum\limits_{r=0}^{\infty}a_rx^r$ B) $\sum\limits_{r=0}^{\infty}a_rx^r$ C) $\sum\limits_{r=0}^{\infty}a_rx^{m-r}$ D) None of these

b. Solve $y'' + a^2y = \sec ax$ by the method of variation of parameters. **(04 Marks)**

c. Solve $x^2\dfrac{d^2y}{dx^2} + 4x\dfrac{dy}{dx} + 2y = e^x$. **(06 Marks)**

d. Obtain the series solution of $\dfrac{dy}{dx} - 2xy = 0$. **(06 Marks)**

4 a. Choose the correct answers for the following : **(04 Marks)**

i) PDE of $az + b = a^2x + y$ is,

A) $\dfrac{\partial z}{\partial x}\cdot\dfrac{\partial z}{\partial y} = 1$ B) $\dfrac{\partial z}{\partial x}\cdot\dfrac{\partial z}{\partial y} = 0$ C) $\dfrac{\partial z}{\partial x} + \dfrac{\partial z}{\partial y} = 0$ D) $\dfrac{\partial z}{\partial x} + \dfrac{\partial z}{\partial y} = 1$

ii) The solution of PDE $Z_{xx} = 2y^2$ is,

A) $z = x^2 + xf(y) + g(y)$ B) $z = x^2y^2 + xf(y) + g(y)$

C) $z = x^2y^3 + f(x) + g(x)$ D) $z = y^2 + xf(y) + g(y)$

iii) The subsidiary equations of $(y^2 + z^2)p + x(yq - z) = 0$ are,

A) $\dfrac{dx}{p} = \dfrac{dy}{q} = \dfrac{dz}{R}$ B) $\dfrac{dx}{y^2 + z^2} = \dfrac{dy}{x} = \dfrac{dz}{xz}$

C) $\dfrac{dx}{y^2 + z^2} = \dfrac{dy}{xy} = \dfrac{dz}{xz}$ D) None of these

iv) In the method of separation of variables to solve $xz_n + z_t = 0$ the assumed solution is of the form,

A) $X(x)Y(x)$ B) $X(y)Y(y)$ C) $X(t)Y(t)$ D) $X(x)T(t)$

b. Solve $\dfrac{\partial^3 z}{\partial x^2 \partial y} = \cos(2x + 3y)$. **(04 Marks)**

c. Solve $xp - yq = y^2 - x^2$ **(06 Marks)**

d. Solve $3u_x + 2u_y = 0$ by the separation of variable method given that $u = 4e^{-x}$ when $y = 0$. **(06 Marks)**

PART – B

5 a. Choose the correct answers for the following : **(04 Marks)**

i) $\int_0^1 \int_0^{x^2} e^{y/x} \, dy \, dx = $ _____

    A) 1   B) - 1/2   C) 1/2   D) None of these

ii) The integral $\iint_R f(x,y) \, dx \, dy$ by changing to polar form becomes,

    A) $\iint_R \phi(r,\theta) \, dr \, d\theta$ B) $\iint_R f(r,\theta) \, dr \, d\theta$ C) $\iint_R f(r,\theta) \, r \, dr \, d\theta$ D) $\iint_R \phi(r,\theta) \, r \, dr \, d\theta$

iii) For a real positive number n, the Gamma function $\Gamma(n) = $ _____

    A) $\int_0^\infty x^{n-1} e^{-x} dx$ B) $\int_0^1 x^{n-1} e^{-x} dx$ C) $\int_0^x x^n e^{-x} dx$ D) $\int_0^1 x^n e^{-x} dx$

iv) The Beta and Gamma functions relation for B(m,n) = _____

    A) $\dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m-n)}$ B) $\dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$ C) $\Gamma(m)\Gamma(n)$ D) $\Gamma(mn)$

b. By changing the order of integration evaluate, $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2) \, dy \, dx$, $a > 0$. **(04 Marks)**

c. Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} \, dz \, dy \, dx$. **(06 Marks)**

d. Express the integral $\int_0^1 \dfrac{dx}{\sqrt{1-x^n}}$ in terms of the Gamma function. Hence evaluate $\int_0^1 \dfrac{dx}{\sqrt{1-x^{2/3}}}$. **(06 Marks)**

6 a. Choose the correct answers for the following : **(04 Marks)**

i) The scalar surface integral of $\vec{f}$ over s, where s is a surface in a three-dimensional region R is given by, $\iint_s \vec{f} \cdot n \, ds = $ _____ by Gauss divergence theorem.

    A) $\iiint_V \nabla \cdot \vec{f} \, dV$ B) $\iint_S \nabla \cdot \vec{t} \, dx \, dy$ C) $\iiint_V \nabla \cdot \vec{F} \, dV$ D) None of these

ii) If all the surface are closed in a region containing volume V then the following theorem is applicable.
A) Stoke's theorem B) Green's theorem C) Gauss divergence theorem D) None of these

iii) The value of $\int_c \{(2xy - x^2) dx + (x^2 + y^2) dy\}$ by using Green's theorem is,

    A) Zero   B) One   C) Two   D) Three

iv) $\iint_s f \cdot n \, ds = $ _____, where f = xi+yj+2k and S is the surface of the sphere $x^2 + y^2 + z^2 = a^2$

    A) $4\pi a$ B) $4\pi a^2$ C) $4\pi a^3$ D) 4π

b. Find the work done by a force $f = (2y - x^2)i + 6yzj - 8xz^2k$ from the point (0, 0, 0) to the point (1, 1, 1) along the straight-line joining these points. **(04 Marks)**

c. If C is a simple closed curve in the xy-plane, prove by using Green's theorem that the integral $\int_c \frac{1}{2}(x \, dy - y \, dx)$ represents the area A enclosed by C. Hence evaluate $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$. **(06 Marks)**

d. Verify Stoke's theorem for $\vec{f} = (2x - y)i - yz^2 j - y^2 zk$ for the upper half of the sphere $x^2 + y^2 + z^2 = 1$. **(06 Marks)**

7 a. Choose the correct answers for the following : **(04 Marks)**

     i) $L[t^n] = $ _____

         A) $\dfrac{n}{s^{n+1}}$ B) $\dfrac{n}{s^{n-1}}$ C) $\dfrac{n!}{s^{n-1}}$ D) $\dfrac{n!}{s^{n+1}}$

     ii) $L[e^{-3t}] = $ _____

         A) $\dfrac{3}{s-3}$ B) $\dfrac{3}{s+3}$ C) $\dfrac{1}{s+3}$ D) $\dfrac{1}{s-3}$

     iii) $L\{f(t-a)H(t-a)\}$ is equal to,

         A) $\dfrac{3!}{(s+2)^4}$ B) $\dfrac{3!}{(s-2)^4}$ C) $\dfrac{3}{(s-2)^4}$ D) $\dfrac{3}{(s-2)}$

     iv) $L\{\delta(t-1)\} = $ _____

         A) e^{-s} B) e^{s} C) e^{as} D) e^{-as}

   b. Evaluate $L\{\sin^3 2t\}$. **(06 Marks)**

   c. Find $L\{f(t)\}$, given that $f(t) = \begin{cases} 2, & 0 < t < 3 \\ t, & t > 3 \end{cases}$. **(06 Marks)**

   d. Express $f(t) = \begin{cases} t^2 & 0 < t < 2 \\ 4t & 2 < t \leq 4 \\ 8 & t > 4 \end{cases}$ in terms of unit step function and hence find their Laplace transform. **(04 Marks)**

8 a. Choose the correct answers for the following : **(04 Marks)**

     i) $L^{-1}\{\cos at\} = $ _____

         A) $\dfrac{s}{s^2+a^2}$ B) $\dfrac{s}{s^2-a^2}$ C) $\dfrac{1}{s^2+a^2}$ D) $\dfrac{1}{s^2-a^2}$

     ii) $L^{-1}\{\bar{f}(s-a)\} = $ _____

         A) $e^{t}f(t)$ B) $e^{at}f(t)$ C) $e^{-at}f(t)$ D) None of these

     iii) $L^{-1}\left\{\cot^{-1}\left(\dfrac{2}{s^2}\right)\right\} = $ _____

         A) $\dfrac{\sin t}{t}$ B) $\dfrac{\sinh at}{t}$ C) $\dfrac{\sin at}{t}$ D) $\dfrac{\sinh t}{t}$

     iv)   For the function $f(t) = 1$, convolution theorem condition,

         A) Not satisfied   B) Satisfied with some condition

         C) Satisfied   D) None of these

   b. Find the inverse Laplace transform of $\dfrac{2s^2-6s+5}{(s-1)(s-2)(s-3)}$. **(04 Marks)**

   c. Find $L^{-1}\left\{\dfrac{s}{(s-1)(s^2+4)}\right\}$ using convolution theorem. **(06 Marks)**

   d. Solve differential equation $y''(t) + y = F(t)$, where $F(t) = \begin{cases} 0 & 0 < t < 1 \\ 2 & t > 1 \end{cases}$. Given that $y(0) = 0 = y'(0)$. **(06 Marks)**

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